

DESIGN CALCULATION

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT – 16.00M) RESIDENTIAL BUILDING WITH 12 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO.31 IN VANCHINATHAN STREET,MADIPAKKAM, CHENNAI 600091, COMPRISED IN OLD S.NO.220/1 AND 220/28 AS PER PATTANAM NEW S.NO. 220/139 OF MADIPAKKAM-1 VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

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*Structural Design Calculation for Construction of RESIDENTIAL BUILDING(S+4)
AT PLOT NO.31 IN VANCHINATHAN STREET, MADIPAKKAM.*

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1.0 DESIGN BRIEF:

THIS DOCUMENT PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT – 16.00M) RESIDENTIAL BUILDING WITH 12 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO.31 IN VANCHINATHAN STREET,MADIPAKKAM, CHENNAI 600091, COMPRISED IN OLD S.NO.220/1 AND 220/28 AS PER PATTA NEW S.NO. 220/139 OF MADIPAKKAM-1 VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

2.0 GENERAL DESIGN CRITERIA

2.1. Description of the structure

The Residential Building consists of Stilt Floor + 4 Upper floors and the structure is designed as a RCC framed structure.

- | | |
|---|---|
| 1. Size of the building | : 28.04 X 10.28M |
| 2. Height of the building | : 16.00M |
| 3. Number of storeys above GL | : Stilt Floor +4 upper floors |
| 4. Floor to floor height of this building | : Stilt and First floors - 3.20m
: Typical floor – 3.20m |
| 5. Type of foundation | : Isolated foundation as per geotechnical report |

2.2. Materials Used

Following materials are generally used in the design of the various components of the structure.

For Concrete Structure

- M25 grade concrete for all reinforced concrete parts of the structure
- Fe500 grade Structural reinforcement steel
- Masonry for all walls : Brick / Block

2.3. Design Codes & Standards

Following codes and specifications have been generally used in the design of the members of the structure.

- IS 456 : 2000 Code of practice for Plain and Reinforced concrete
- SP: 16 Design Aids for Reinforced concrete
- IS 875 : 1987 Design Loads for building and structures
- IS 1893 : 2002 Criteria for Earthquake Resistant design of structures
- IS 13920: 1993 Ductile Detailing of R.C structures subjected to Seismic forces
- SP: 34 Handbook on Concrete Reinforcement & Detailing
- IS 800 : 1984 Code of practice for general construction in steel
- IS 2062 : 1999 Steel for general structural purposes specification
- IS 1786: 1985 Specification for high strength deformed bars and wires for concrete reinforcement

3.0 LOADING

Primary Load:

- Dead Load (DL)
- Live Load (LL)

3.1. Dead load (DL)

Material weight

- Density of Concrete =25 kN/m³



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- D.L. due to partitions
(Light Partition as per IS 875) = 1.50 kN/m²
- D.L. due to floor finish 50mm thick = 0.05x25 = 1.25 kN/m²

3.2. Live load (LL)

Minimum Uniformly Distributed Live Loads:

Occupancy or use	Live Load (kn/m ²)
• All rooms and kitchens	2.00
• Toilet and bath rooms	3.00
• Corridors, passages, staircases	3.00
• Balconies	3.00
• Terrace Floor	1.50
• Basic wind speed	=50 m/sec
• Seismic Zone	=Zone III

3.5 Loading Combinations

The following combinations of Loads as per IS 1893 is considered in the STAAD Analysis

- 1.5(DL +LL)
- 1.2(DL + LL)

The below load combinations are used to check the structure in serviceability condition.

- 1.0(DL +LL)

4.0 STRUCTURAL MATERIAL:

4.1 Concrete Material Specifications:

Concrete compressive cube strength	- 25 N/mm ²
Minimum cement content	- Refer standard drawings for general & Legends
Cement type	- OPC
Free water cement ratio	- 0.5 (Maximum)
Nominal maximum size of aggregate	- 20mm UNO

4.2 Reinforcement:

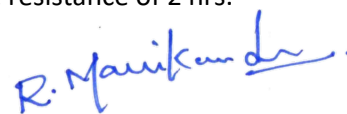
Steel reinforcement shall be deformed bars, the characteristic of reinforcement bars shall conform to the following specification:

Grade of Steel	Actual Yield Strength (MPa)
Grade Fe500	Minimum 500 MPa,

4.4 Concrete cover:

Cover for Reinforcement is considered as per Table 16A of NBC, for a Fire resistance of 2 hrs.

- Raft Slab = 50mm
- Footing = 50mm
- RC Wall = 30mm
- Columns = 40mm


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- Beams = 30mm
- Slabs = 25mm

5.0 Structural Description

5.1. Method of analysis

Structure analysis & design:

The structure is analyzed as a Space frame structure in STADD Pro Vi8. Columns, Footing, Basement walls, slabs, Beams and Staircases are designed as reinforced concrete members.

5.2. Framing System, Analysis and Design

Limit State concept of design will be used as per IS: 456-2000 & SP - 16. The detailing of reinforcement shall be done satisfying the requirements of IS: 456-2000, SP-16, IS: 13920, IS: 4326-1993 and SP-34.

The Slabs and beams are checked for deflection as per IS 456:2000. Cover for Reinforcement is considered as per Table 16A of NBC, for a Fire resistance of 2 hrs.



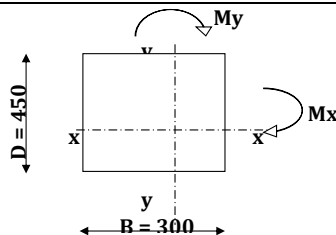
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Structural Design Calculation for Construction of RESIDENTIAL BUILDING(S+4)
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APPENDIX I
Design Calculations
Column Design



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PROJECT	RESIDENTIAL BUILDING(S+4) AT PLOT NO.31 IN VANCHINATHAN STREET, MADIPAKKAM.	DOCUMENT. NO.	DATE	DESIGNED	DATE		
TITLE	Design for a Short Column with Biaxial Bending	REVISION	DATE	CHECKED	DATE		
CL. NO.	DESIGN CALCULATIONS			REFERENCES			
1.0	Column No:	 CRITICAL LOAD CASE: M 25 Fe 500					
1.1	Basic Data						
1.1	Material Data						
1.1	Grade of Concrete						
1.1	Grade of Steel						
1.2	Codal Data						
1.2	Nominal Cover	=	40 mm	≥ 12 mm	CI 26.4.2.1,IS456:2000		
1.2	Diameter of the Bar	=	25 mm				
1.2	d'	=	52.5 mm				
1.3	Basic Dimensions						
1.3	Unsupported Length of the Column	L _{ox}	= 3000 mm	Table 28 , IS456:2000			
1.3		L _{oy}	= 3000 mm				
1.3		L _{ex}	= 3000 mm				
1.3		L _{ey}	= 3000 mm				
1.3	Size of the Column	B X D	= 300 x 450 mm	STAAD OUTPUT			
1.4	Analysis Results						
1.4	Factored Axial Load	P _u	= 780.0 kN				
1.4	Factored Moment	M _{ux}	= 22.00 kNm				
1.4	Factored Moment	M _{uy}	= 71.00 kNm				
2.0	Check for Slenderness						
2.0	Slenderness Ratio about Major Axis	L _{ex} / D	= 6.667				
2.0	Slenderness Ratio about Minor Axis	L _{ey} / B	= 10.000				
	Since Leff / LLD <12 Designed as Short Column				CI 25.1.2, IS456:2000		
3.0	Check for Eccentricity						
3.0	Minimum Eccentricit e _x	= L _{ox} / 500 + D / 30	= 21.0 mm	>20	CI 25.4 IS456:2000		
3.0	e _y	= L _{oy} / 500 + B / 30	= 16.0 mm	<20			
3.1	Moments Due to Minimum Eccentricity						
3.1		Me _x	= 16.38 kN.m				
3.1		Me _y	= 15.60 kN.m				
4.0	Design Moment						
4.0	Design Moment about X axis	M _{ux}	= 22.00 kN.m				
4.0	Design Moment about Y axis	M _{uy}	= 71.00 kN.m				

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CL. NO.	DESIGN CALCULATIONS	REFERENCES			
5.0	Uniaxial Moment Carrying capacity of the Section about X & Y- axis $d' / D = 0.117$ $d' / B = 0.175$ Assume the Reinforcement Percentage $p = 2.00$ $p / f_{ck} = 0.080$ $p_u / f_{ck}BD = 0.231$ Reinforcement distributed equally on four sides 4 $M_{ux1} / f_{ck}BD^2 =$ $M_{uy1} / f_{ck}DB^2 =$ Moment carrying capacity about X axis $M_{ux1} =$ kN.m Moment carrying capacity about Y axis $M_{uy1} =$ kN.m Pu < Axial Load Carrying capacity ; Hence O.K	Chart 43 - 46 SP 16 : 1980			
6.0	Calculation of P_{uz} $P_{uz} = 0.45 f_{ck} A_c + 0.75 f_y A_{sc} = 2500.88 \text{ kN}$ $P_u / P_{uz} = 0.312$ $a_n = 1.186$	CI 39.6 , IS456:2000 CI 39.6 , IS456:2000			
7.0	Criteria for Biaxial Bending (Bresler's Formulation) $(M_{ux}/M_{ux1})^{an} + (M_{uy}/M_{uy1})^{an} = 1$	CI 39.6 , IS456:2000			
8.0	Longitudinal Reinforcement Area of compression Steel $A_{sc,reqd} = 2700 \text{ mm}^2$ 10 No Y20 + No Y20 $A_{sc,pro} = 3142 \text{ mm}^2$				
8.1	Check for Minimum & Maximum Area of Steel Minimum Area of ste (0.8 % of A_g dir) $= 441 \text{ mm}^2$ (Based on the area of concrete reqd to resist direct stress) Maximum Area of ste (4 % of A_g) $= 5400 \text{ mm}^2$ 441 < 3142 < 5400 mm^2 Area of Steel is with in the permissible limit ; Hence O.K	CI 26.5.3.1 a & b , IS 456 : 2000			
9.0	Transverse Reinforcement				
9.1	Diameter of Transverse Reinforcement $= 8 \text{ mm} \geq 6 \text{ mm}$	CI 26.5.3.2 c 2) ,			
9.2	Spacing of Lateral Ties : i) Least Lateral Dimension of the column $= 300 \text{ mm}$ ii) 16 times the Smallest dia of Longitudinal Steel $= 320 \text{ mm}$ iii) $= 300 \text{ mm}$ Reqd. Spacing of Ties (Minimum of the above) $= 300 \text{ mm}$ Provide 8 mm dia Lateral Ties @ 300 mm Spacing Provide closer spacing on either side of the column above and below beam / slab.	CI 26.5.3.2 c 1) , IS 456 : 2000			

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Footing Design



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Design of Isolated Footing

F2

Node : **38**

Basic Data:

Net Safe Bearing Capacity	150 kN/m ²
Unit weight of Soil	18 kN/m ³
Unit weight of Concrete	25 kN/m ³
Grade of Concrete	25 N/mm ²
Grade of Steel	500 N/mm ²
Clear Cover to Reinforcement	50 mm
Earth Fill above FGL	0 mm
Base Area of Footing	3.78 m ²
Ixx	1.02 m ⁴
Izz	1.39 m ⁴
Weight of Footing	47.25 kN
Weight of soil	85.29 kN

Gross Bearing Pressure Calculation (kN/m²)

Critical Load Combinations	Pmax	Pmin
200	154.11	154.111905
0	35.06	35.06

Gross SB (w/o increase) 182.4 kN/m²

Hence **OK**

Factored Net Upward Pressure Calculation

Load Factor for Design 1.5

Critical Load Combinations	Pmax	Pmin
200	178.57	178.571429
0	0.00	0.0

Dsgn.(+ve) BM abt. X-axis M 50.22 kN.m

Dsgn.(+ve) BM abt. Z-axis M 60.77 kN.m

Dsgn.(-ve) BM abt. X-axis M 0.00 kN.m

Dsgn.(-ve) BM abt. Z-axis M 0.00 kN.m

Provided Eff. depth for Mux 432.00 mm

Provided Eff. depth for Muz 444.00 mm

Mu,lim ##### kN.m

Depth provided is #####

Bottom Reinforcement

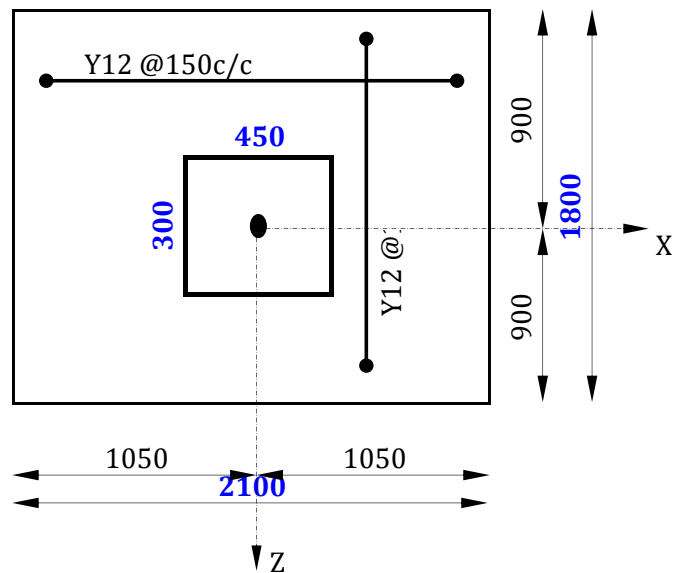
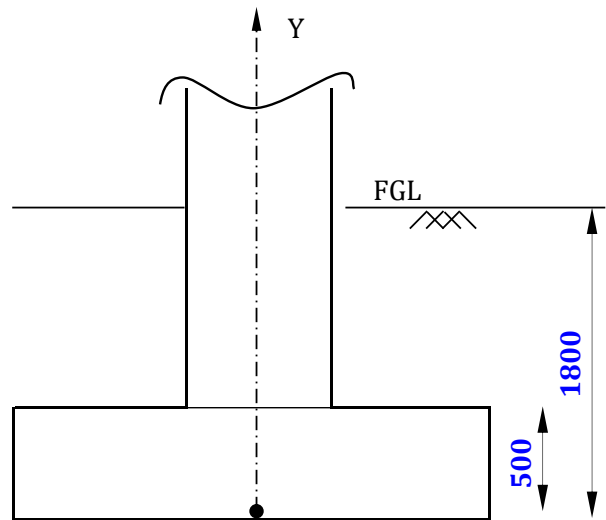
Ast Required for Mux ##### mm²

Ast Required for Muz ##### mm²

Min. Ast Req'd. 600 mm²

Bottom Reinforcement

Provide 12	@ 150	C/C	along Z
Provide 12	@ 150	C/C	along X



Ast Provided	Ast Required	Hence
754	#NAME? mm ²	
754	#NAME? mm ²	#####


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Design of Isolated Footing	F2	Node :	38
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Design of Isolated Footing	F2	Node :	38
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Design of Isolated Footing	F2	Node :	38
----------------------------	----	--------	----

Design of Isolated Footing	F2	Node :	38
----------------------------	----	--------	----

Top Reinforcement

Ast Required for Mux	0.00 mm ²
----------------------	----------------------

Ast Required for Muz	0.00 mm ²
----------------------	----------------------

Min. Ast Req'd.	Not Req'd mm ²
-----------------	---------------------------

Check For Flexural / Oneway Shear

	Actual	Allowable	Hence	
Shear Stress (Plane ll to X)	0.131	#NAME?	N/mm ²	#NAME?
Shear Stress (Plane ll to Z)	0.153	#NAME?	N/mm ²	#NAME?

Check For Punching / Twoway Shear

Allowable Shear Stress	1.25 N/mm ²
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Actual Shear Stress	0.46 N/mm^2	Hence	OK
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Actual Shear Stress	0.46 N/mm^2	Hence	OK
---------------------	-----------------------	-------	-----------

Actual Shear Stress	0.46 N/mm^2	Hence	OK
---------------------	-----------------------	-------	-----------

Check For Overturning

Co-efficient of friction = 0.57

Factor of safety for overturning, $slidi = 1.4$

Net Moments acting at Pad Level, $M_x = 0.00 \text{ kNm}$

Net Moments acting at Pad Level, M_{zi} = 0.00 kNm

$$\text{Weight of pad} = 47.25 \text{ kN}$$

Weight of Over burden Earth = 85.29 kN

Total downward Load = 582.54 kN

Stabilizing moment along X-Dir	=	582.54	x	1.05
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$$= 611.67 \text{ kNm}$$

Actuating moment, M_{zz}	=	0.00 kNm
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Factor of Safety (Along X-Dir) = 611.67 / 0.0

- > 1.40 Hence **OK**

- > 1.40 Hence **OK**

- > 1.40 Hence **OK**

Check For Sliding

$$\text{Resistance against Sliding} = 332.05 \text{ kN}$$

Max. Shear Load @ Pad level in X-Dir = 2.5 kN

Max. Shear Load @ Pad level in Z-Dir = 5.3 kN

Factor of Safety (Along X-Dir) = 332.0 / 2.5

	130.73	>	1.40	Hence	OK
--	--------	---	------	-------	-----------

	130.73	>	1.40	Hence	OK
--	--------	---	------	-------	-----------

	130.73	>	1.40	Hence	OK
--	--------	---	------	-------	-----------

Factor of Safety (Along Z-Dir) = 332.0 / 5.3

	62.65	>	1.4	Hence	OK
--	-------	---	-----	-------	-----------

	62.65	>	1.4	Hence	OK
--	-------	---	-----	-------	-----------

	62.65	>	1.4	Hence	OK
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Plinth Beam Design



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TITLE		REVISION	DATE	CHECKED RMK	DATE															
CL. NO.	BEAM DESIGN CALCULATIONS			REFERENCES																
1.1	<u>Geometry Data</u> Beam Number = PB2 Type of Beam = Rectangular Beam Support Condition = Continuous Beam Width of beam b = 200 mm Overall Depth of Beam D = 380 mm Dia of bar Φ = 25 mm Nominal Cover cc = 30 mm Effective Depth d = 337.5 mm Effective Cover = 42.5 mm Effective Span of beam l _{eff} = 4500 mm Concrete grade = M 25 Steel Grade = Fe 500 p _{t,lim} = 0.944 % p _{t,min} = 0.170 % p _t & p _{cmax} = 4.00 %			IS 456:2000 Table 19 IS 456:2000 Cl 23.0 IS 456:2000 Cl 26.5.1.1																
1.2	<u>Force Input</u> Left negative moment (Support 1) = 84 kNm Mid span positive moment = 84 kNm Right negative moment (Support 2) = 84 kNm Shear @ (Support 1) = 149 kN Shear @ (Span) = 149 kN Shear @ (Support 2) = 149 kN																			
1.3	<u>Limiting Moment</u> M _{ulim} = 0.133 f _{ck} b d ² = 75.75 kNm																			
1.4	<u>Area of Steel</u> Minimum Area of Steel = 0.17% b d = 114.75 mm ² <u>Support 1</u> Negative moment (Support 1) = 84 kNm Hence the Section is designed as Doubly Reinforced Section M _u /bd ² = 3.687 Percentage of tension steel reqd p _t = 1.039 % Percentage of compression steel reqd p _c = 0.106 % Required Area of tension steel A _{st reqd} = 701.33 mm ² Required Area of compression steel A _{sc reqd} = 71.55 mm ² <u>Detail of bars</u> <table><tr><td></td><td colspan="2">I st Layer</td><td colspan="2">II nd Layer</td></tr><tr><td></td><td>Nos</td><td>Dia</td><td>Nos</td><td>Dia</td></tr><tr><td>Tension Reinforcement</td><td>3</td><td>16</td><td></td><td></td></tr></table> A _{st} provided = 603.19 mm ²				I st Layer		II nd Layer			Nos	Dia	Nos	Dia	Tension Reinforcement	3	16				
	I st Layer		II nd Layer																	
	Nos	Dia	Nos	Dia																
Tension Reinforcement	3	16																		


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TITLE			REVISION	DATE	CHECKED RMK	DATE
CL. NO.	BEAM DESIGN CALCULATIONS				REFERENCES	
	Nos Dia Compression Reinforcement 316 A_{sc} provided = 603.19 mm² Percentage of tension steel provided p_t = 0.894 % Percentage of compression steel provided p_c = 0.894 % Check for Shear Shear = 149 kN Nominal Shear Stress t_v = 2.21 N/mm² Permissible Shear Stress t_c = 0.92 N/mm² Maximum Shear Stress t_{c,max} = 2.5 N/mm² Diameter of the Stirrup bar = 8 mm Number of Legs = 2 Spacing of Shear reinforcement Required = 160.0 Maximum Spacing of Shear Reinforcement = 250 Provide 8 mm dia 2 legged stirrups @ 160mm c/c spacing Support 2 Negative moment = 84 kNm Hence the Section is designed as Doubly Reinforced Section M_u/bd² = 3.687 Percentage of tension steel reqd p_t = 1.039 % Percentage of compression steel reqd p_c = 0.106 % Required Area of tension steel A_{st reqd} = 701.33 mm² Required Area of compression steel A_{sc reqd} = 71.55 mm² Detail of bars I st Layer Nos Dia Tension Reinforcement 316 A_{st} provided = 603.19 mm² Compression Reinforcement 316 A_{sc} provided = 603.19 mm² Percentage of tension steel provided p_t = 0.894 % Percentage of compression steel provided p_c = 0.894 % Check for Shear Shear = 149 kN Nominal Shear Stress t_v = 2.21 N/mm² Permissible Shear Stress t_c = 0.92 N/mm² Maximum Shear Stress t_{c,max} = 2.5 N/mm² Diameter of the Stirrup bar = 8 mm Cl 40.1, IS456:2000 β = 1.000 Table 19, IS456:2000 Table 20, IS456:2000 Cl 40.4, IS456:2000 Cl 26.5.1.5,IS456:2000 Cl 40.1, IS456:2000 β = 1.000 Table 19, IS456:2000 Table 20, IS456:2000 Not safe Hence O.K Not safe Hence O.K Not safe Hence O.K					


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PROJECT	RESIDENTIAL BUILDING(S+4) AT PLOT NO.31 IN VANCHINATHAN STREET, MADIPAKKAM.	DOCUMENT. NO	DATE	DESIGNED RMK	DATE																									
TITLE		REVISION	DATE	CHECKED RMK	DATE																									
CL. NO.	BEAM DESIGN CALCULATIONS			REFERENCES																										
	Number of Legs = 2 Spacing of Shear reinforcement Required = 160.0 Maximum Spacing of Shear Reinforcement = 250 Provide 8 mm dia 2 legged stirrups @ 160mm c/c spacing			Cl 40.4, IS456:2000 Cl 26.5.1.5,IS456:2000																										
	Span Positive moment (Span) = 84 kNm Hence the Section is designed as Doubly Reinforced Section $M_u/bd^2 = 3.325$ Percentage of tension steel reqd $p_t = 1.039\%$ Percentage of compression steel reqd $p_c = 0.106\%$ Required Area of tension steel $A_{st\ reqd} = 701.33\ mm^2$ Required Area of compression steel $A_{sc\ reqd} = 71.55\ mm^2$ <u>Detail of bars</u> <table><tr><td></td><td colspan="2">I st Layer</td><td colspan="2">II nd Layer</td></tr><tr><td>Tension Reinforcement</td><td>Nos 3</td><td>Dia 16</td><td>Nos 0</td><td>Dia 0</td></tr><tr><td></td><td colspan="4">$A_{st\ provided} = 603.19\ mm^2$</td></tr><tr><td>Compression Reinforcement</td><td>Nos 3</td><td>Dia 16</td><td>Nos 0</td><td>Dia 0</td></tr><tr><td></td><td colspan="4">$A_{sc\ provided} = 603.19\ mm^2$</td></tr></table> Percentage of tension steel provided $p_t = 0.894\%$ Not safe Percentage of compression steel provid $p_c = 0.894\%$ Hence O.K				I st Layer		II nd Layer		Tension Reinforcement	Nos 3	Dia 16	Nos 0	Dia 0		$A_{st\ provided} = 603.19\ mm^2$				Compression Reinforcement	Nos 3	Dia 16	Nos 0	Dia 0		$A_{sc\ provided} = 603.19\ mm^2$					
	I st Layer		II nd Layer																											
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	<u>Check for Shear</u> Shear = 149 kN Nominal Shear Stress $t_v = 2.21\ N/mm^2$ Permissible Shear Stress $t_c = 0.92\ N/mm^2$ Maximum Shear Stress $t_{c,max} = 2.5\ N/mm^2$ Diameter of the Stirrup bar = 8 mm Number of Legs = 2 Spacing of Shear reinforcement Required = 160.0 Maximum Spacing of Shear Reinforcement = 250 Provide 8 mm dia 2 legged stirrups @ 160mm c/c spacing			Cl 40.1, IS456:2000 $\beta = 1.000$ Table 19, IS456:2000 Table 20, IS456:2000 Cl 40.4, IS456:2000 Cl 26.5.1.5,IS456:2000																										
	<u>Check For Deflection</u> Basic Value = 26 Service Stress in Steel $f_s = 337.19\ N/mm$ Modification Factor(Tension Reinforcement) $F_1 = 0.78$ Allowable Span/Depth = 20.28 Actual Span/Depth = 13.33 Hence Safe			Cl.23.2, IS456:2000																										


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Structural Design Calculation for Construction of RESIDENTIAL BUILDING(S+4)
AT PLOT NO.31 IN VANCHINATHAN STREET, MADIPAKKAM.

Floor Beam Design



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TITLE		REVISION	DATE	CHECKED RMK	DATE																				
CL. NO.	BEAM DESIGN CALCULATIONS			REFERENCES																					
1.1	<u>Geometry Data</u> Beam Number = B3 Type of Beam = Rectangular Beam Support Condition = Continuous Beam Width of beam b = 200 mm Overall Depth of Beam D = 530 mm Dia of bar Φ = 25 mm Nominal Cover cc = 30 mm Effective Depth d = 487.5 mm Effective Cover = 42.5 mm Effective Span of beam l _{eff} = 3700 mm Concrete grade = M 25 Steel Grade = Fe 500 p _{t,lim} = 0.944 % p _{t,min} = 0.170 % p _t & p _{cmax} = 4.00 %			IS 456:2000 Table 19 IS 456:2000 Cl 23.0 IS 456:2000 Cl 26.5.1.1																					
1.2	<u>Force Input</u> Left negative moment (Support 1) = 254 kNm Mid span positive moment = 254 kNm Right negative moment (Support 2) = 254 kNm Shear @ (Support 1) = 241 kN Shear @ (Span) = 241 kN Shear @ (Support 2) = 241 kN																								
1.3	<u>Limiting Moment</u> M _{ulim} = 0.133 f _{ck} b d ² = 181.75 kNm																								
1.4	<u>Area of Steel</u> Minimum Area of Ste = 0.17% b d = 190.6125 mm ²																								
	<u>Support 1</u> Negative moment (Support 1) = 254 kNm Hence the Section is designed as Doubly Reinforced Section M _u /bd ² = 4.647 Percentage of tension steel reqd p _t = 1.277 % Percentage of compression steel reqd p _c = 0.359 % Required Area of tension steel A _{st reqd} = 1431.84 mm ² Required Area of compression steel A _{sc reqd} = 402.53 mm ² <u>Detail of bars</u> <table><tr><td></td><td colspan="2">I st Layer</td><td colspan="2">II nd Layer</td></tr><tr><td>Tension Reinforcement</td><td>Nos 3</td><td>Dia 20</td><td>Nos 3</td><td>Dia 20</td></tr><tr><td></td><td colspan="2">A_{st} provided =</td><td colspan="2">1884.96 mm²</td></tr><tr><td>Compression Reinforcement</td><td>Nos 3</td><td>Dia 20</td><td>Nos 3</td><td>Dia 20</td></tr></table>				I st Layer		II nd Layer		Tension Reinforcement	Nos 3	Dia 20	Nos 3	Dia 20		A _{st} provided =		1884.96 mm ²		Compression Reinforcement	Nos 3	Dia 20	Nos 3	Dia 20		
	I st Layer		II nd Layer																						
Tension Reinforcement	Nos 3	Dia 20	Nos 3	Dia 20																					
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TITLE			REVISION	DATE	CHECKED RMK	DATE
CL. NO.	BEAM DESIGN CALCULATIONS				REFERENCES	
	A_{sc} provided = 1884.96 mm² Percentage of tension steel provided p_t = 1.681 % Hence O.K Percentage of compression steel provided p_c = 1.681 % Hence O.K Check for Shear Shear = 241 kN Nominal Shear Stress t_v = 2.15 N/mm² Permissible Shear Stress t_c = 0.92 N/mm² Maximum Shear Stress $t_{c,max}$ = 2.5 N/mm² Diameter of the Stirrup bar = 8 mm Number of Legs = 2 Spacing of Shear reinforcement Required = 150.0 Maximum Spacing of Shear Reinforcement = 300 Provide 8 mm dia 2 legged stirrups @ 150mm c/c spacing Support 2 Negative moment = 254 kNm Hence the Section is designed as Doubly Reinforced Section M_u/bd^2 = 4.647 Percentage of tension steel reqd p_t = 1.277 % Percentage of compression steel reqd p_c = 0.359 % Required Area of tension steel $A_{st\ reqd}$ = 1431.84 mm² Required Area of compression steel $A_{sc\ reqd}$ = 402.53 mm² Detail of bars I st Layer Nos Dia Tension Reinforcement 3 20 A_{st} provided = 1884.956 mm² Nos Dia Compression Reinforcement 3 20 A_{sc} provided = 1884.96 mm² Percentage of tension steel provided p_t = 1.681 % Hence O.K Percentage of compression steel provided p_c = 1.681 % Hence O.K Check for Shear Shear = 241 kN Nominal Shear Stress t_v = 2.15 N/mm² Permissible Shear Stress t_c = 0.92 N/mm² Maximum Shear Stress $t_{c,max}$ = 2.5 N/mm² Diameter of the Stirrup bar = 8 mm Number of Legs = 2 Spacing of Shear reinforcement Required = 150.0 Maximum Spacing of Shear Reinforcement = 300 Cl 40.1, IS456:2000 β = 1.000 Table 19, IS456:2000 Table 20, IS456:2000 Cl 40.4, IS456:2000 Cl 26.5.1.5,IS456:2000					


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TITLE		REVISION	DATE	CHECKED RMK	DATE
CL. NO.	BEAM DESIGN CALCULATIONS			REFERENCES	
	Provide 8 mm dia 2 legged stirrups @ 150mm c/c spacing				
	Span				
	Positive moment (Span)	=	254 kNm		
	Hence the Section is designed as Doubly Reinforced Section				
		M_u/bd^2	= 3.325		
	Percentage of tension steel reqd	p_t	= 1.277 %		
	Percentage of compression steel reqd	p_c	= 0.359 %		
	Required Area of tension steel	$A_{st\ reqd}$	= 1431.84 mm ²		
	Required Area of compression steel	$A_{sc\ reqd}$	= 402.53 mm ²		
	<u>Detail of bars</u>				
	I st LayerII nd Layer				
	Nos	Dia	Nos	Dia	
	Tension Reinforcement 3	20	3	20	
		$A_{st\ provided}$	= 1884.96 mm ²		
	Nos	Dia	Nos	Dia	
	Compression Reinforcement 3	20	3	20	
		$A_{sc\ provided}$	= 1884.96 mm ²		
	Percentage of tension steel provided	p_t	= 1.681 %	Hence O.K	
	Percentage of compression steel provided	p_c	= 1.681 %	Hence O.K	
	<u>Check for Shear</u>				
	Shear	=	241 kN		
	Nominal Shear Stress	t_v	= 2.15 N/mm ²	Cl 40.1, IS456:2000	
	Permissible Shear Stress	t_c	= 0.92 N/mm ²	β = 1.000	
	Maximum Shear Stress	$t_{c,max}$	= 2.5 N/mm ²	Table 19, IS456:2000	
	Diameter of the Stirrup bar	=	8 mm	Table 20, IS456:2000	
	Number of Legs	=	2		
	Spacing of Shear reinforcement Required	=	150.0	Cl 40.4, IS456:2000	
	Maximum Spacing of Shear Reinforcement	=	300	Cl 26.5.1.5,IS456:2000	
	Provide 8 mm dia 2 legged stirrups @ 150mm c/c spacing				
	Check For Deflection				
	Basic Value	=	26	Cl.23.2, IS456:2000	
	Service Stress in Steel	f_s	= 220.29 N/mm ²		
	Modification Factor(Tension Reinforcement)	F_1	= 0.93		
	Allowable Span/Depth	=	24.18		
	Actual Span/Depth	=	7.59	Hence Safe	


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Structural Design Calculation for Construction of RESIDENTIAL BUILDING(S+4)
AT PLOT NO.31 IN VANCHINATHAN STREET, MADIPAKKAM.

Floor Slab Design



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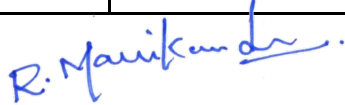
PROJECT	RESIDENTIAL BUILDING(S+4) AT PLOT NO.31 IN VANCHINATHAN STREET, MADIPAKKAM.	DOCUMENT NO.	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE
CL. NO.	DESIGN CALCULATIONS	REFERENCES			
1.0	<u>Design of Two Way Slab S3</u>				
1.0.1	<u>Basic Input Data</u>				
	Grade of concrete	=	M 25		
	Grade of steel	=	Fe 500		
	Thickness of slab	D =	150 mm		
	Clear cover	cc =	25 mm		
	Effective thickness of slab (d_{eff})	150 - 25 - 5 =	120 mm		Table 16 Cl.26.4.2 , IS 456 -2000
	Unit weight of concrete	=	25 KN/m ³		Cl 19.2.1, IS 456-2000
	Effective Shorter Span	L_x =	5 m		
	Effective Longer Span	L_y =	7.7 m		
	Aspect ratio	L_y/L_x =	1.54 < 2		
	Hence designed as Two way slab				Cl D-1.11, IS 456-2000
	Edge Condition	One Long edge Discontinuous			
1.0.2	<u>Load Data</u>				
	Self Weight of Slab	= 0.150 x 25	= 3.750 KN/m ²		
	Floor finish	=	1.500 KN/m ²		
	Partition Load	=	0.000 KN/m ²		
	Sunken Filling	=	0.000 KN/m ²		
	Imposed Load	=	3.000 KN/m ²		IS 875 (Part 2) -1987
	Extra Load, (if Any)	=	0.000 KN/m ²		
	Total load	=	8.250 KN/m ²		
	Design load (W_u) = 1.5 x 8.25	=	12.375 KN/m ²		Table 18 Cl 36.4.1 IS 456 -2000
1.0.3	<u>Moment and Shear Calculations</u>				
	Short Span Direction				
	a_x for positive moment	1.5	→ 0.051		Table 26 Cl D-1.1, IS 456 -2000
		1.75	→ 0.059		
	for 1.54 a_x	=	0.052		
	Positive moment	0.052 x 12.38 x 5 ^2	= 16.17 KN-m		
	a_x for negative moment	1.5	→ 0.067		Table 26 Cl D-1.1, IS 456 -2000
		1.75	→ 0.077		
	for 1.54 a_x	=	0.069		
	Negative moment	0.069 x 12.38 x 5 ^2	= 21.22 KN-m		

R. Manikandan

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TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE
CL. NO.	DESIGN CALCULATIONS	REFERENCES			
1.0.4	Long Span Direction For positive moment $a_y = 0.028$ Positive moment $0.028 \times 12.38 \times 5^2 = 8.66$ KN-m For negative moment $a_y = 0.037$ Negative moment $0.037 \times 12.38 \times 5^2 = 11.45$ KN-m Shear force $V = 12.38 \times 5 \times 1 = 30.94$ KN <u>Check Effective Depth for Max.Bending Moment</u> Depth require $= (M_u / (0.133 \times f_{ck} \times b))^{\frac{1}{3}} = 79.89$ mm Depth provide $= 150 - 25 - 10 / 2 = 120$ mm > 79.89 mm Hence the section is Safe against Bending	Table 26 Cl D-1.1, IS 456 -2000 Table 26 Cl D-1.1, IS 456 -2000 Table C,SP 16 :1980 Cl 2.3			
1.0.5	<u>Check Depth for Shear</u> Nominal Shear Stress $t_v = V_u / b d = 0.26$ N/mm² Design shear stress $t_c = 0.46$ N/mm² $k = 1.30$ $k * t_c = 0.60$ N/mm² $t_v < k * t_c$ Hence the section is Safe against Shear	Cl.40.1, IS 456:2000 Table 19 , IS 456:2000 Cl.40.2.1.1, IS 456:2000			
1.0.6	<u>Check for Maximum Shear Stress:</u> Nominal Shear Stress $t_v = V_u / b d = 0.26$ N/mm² Maximum Shear Stress $t_{c, max} = 3.1$ N/mm² $t_v < 1 t_{c, max}$ Hence the section is Safe against Max.Shear Stress	Cl.40.1, IS 456:2000 Table 20 , IS 456:2000 Cl.40.2.3.1, IS 456:2000			
1.0.7	<u>Reinforcement calculations</u> Short Span Direction @ Support $M_u / b d = \frac{21.22 \times 10^6}{1000 \times 120} = 1.474$ $P_t = 0.37$ %	Table 2-4, SP16 :1980			


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TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE	
CL. NO.	DESIGN CALCULATIONS			REFERENCES		
	Area of steel , = 0.0037 x 1000 x 120 = 439 mm² Minimum area of 0.001 x 1000 x 150 = ##### mm² Spacing of # bar 78.54 x 1000 / 438.88 = 179 mm Check for Spacing Minimum of 1) 3d = 360 mm 2) = 300 mm 3) = 178.86 mm Therefore provid # @ 170 mm C/C Short Span Direction @ Mid Span Mu/bd = $\frac{16.17 \times 10^6}{1000 \times \# \times 120}$ = 1.123 Pt = 0.273 % Area of steel , = 0.0027 x 1000 x 120 = 328 mm² Minimum area of 0.001 x 1000 x 150 = ##### mm² Spacing of # bar 78.54 x 1000 / 327.93 = 239 mm Check for Spacing Minimum of 1) 3d = 360 mm 2) = 300 mm 3) = 239.38 mm Therefore provid # @ 150 mm C/C 150 Provided % of Tension Reinforcement (pt) = 0.436 % Long Span Direction @ Support Mu/bd = $\frac{11.45 \times 10^6}{1000 \times \# \times 120}$ = 0.795 Pt = 0.190 % Area of steel , = 0.0019 x 1000 x 120 = 228 mm² Minimum area of 0.001 x 1000 x 150 = ##### mm² Spacing of # bar 78.54 x 1000 / 228.07 = 344 mm			Cl:26.5.2.1 IS 456 -2000 Cl:26.3.3.(b).1 IS 456 -2000 SP16 :1980 Table 2-4 IS 456:2000 Cl:26.5.2.1 IS 456:2000 Cl:26.3.3.(b).1 SP16 :1980 Table 2-4 IS 456:2000 Cl:26.5.2.1		


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TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE
CL. NO.	DESIGN CALCULATIONS			REFERENCES	
1.0.8	Check for Spacing				
	Minimum of			IS 456:2000	
	1) 3d = 360 mm			Cl:26.3.3.(b).1	
	2) = 300 mm				
	3) = 344.20 mm				
	Therefore provid # @ 300 mm C/C				
	Long Span Direction @ mid Span				
	$M_u/bd = \frac{8.66 \times 10^6}{1000 \times \# \times 120} = 0.602$			SP16 :1980 Table 2-4	
	Pt = 0.142 %				
	Area of steel , = 0.0014 x 1000 x 120 = 171 mm ²			IS 456:2000	
	Minimum area of 0.001 x 1000 x 150 = ##### mm ²			Cl:26.5.2.1	
	Spacing of # bai 78.54 x 1000 / 180.00 = 436 mm				
	Check for Spacing				
	Minimum of			IS 456:2000	
	1) 3d = 360 mm			Cl:26.3.3.(b).1	
	2) = 300 mm				
	3) = 436.11 mm				
	Therefore provid # @ 300 mm C/C				
	Check for Deflection: (Simplified Approach)				
	Basic Span/depth Ratio = 26			IS 456:2000 Cl:23.2.1	
	% of Tension Reinforcement provided (p _t) = 0.436 %				
	Service stress of stee 0.58 fy (Ast_R/Ast_P) = 181.63 N/mm ²			IS456:2000 Fig 4	
	Modification Factor for Tension Reinforcen = 1.71			Page 38	
	Allowable Span / Effective Depth Ratio = 44.47			IS 456:2000 Cl:23.2.1	
	Actual Span/Eff Dept = 5 x 1000 / 120 = 41.67				
	Hence Safe against Deflection				

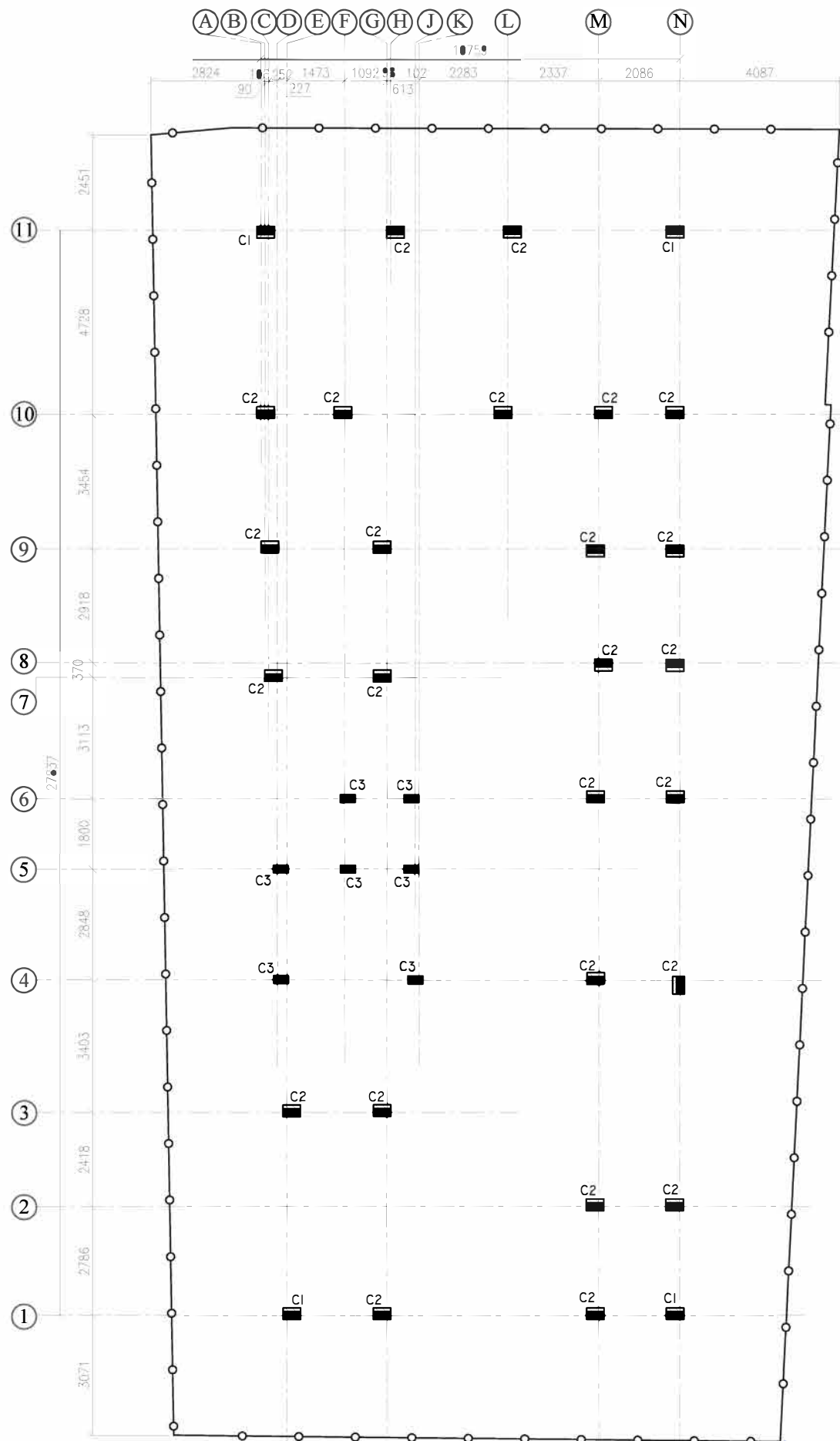

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Structural Design Calculation for Construction of RESIDENTIAL BUILDING(S+4)
AT PLOT NO.31 IN VANCHINATHAN STREET, MADIPAKKAM.

APPENDIX II
GENERAL ARRANGEMENT DRAWINGS

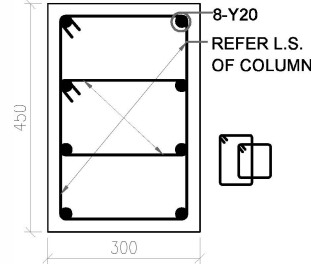
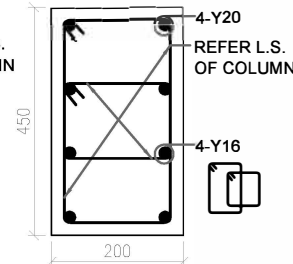
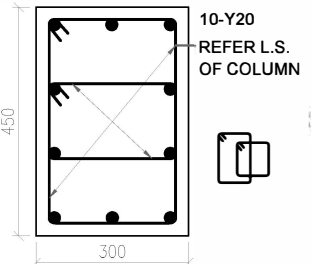
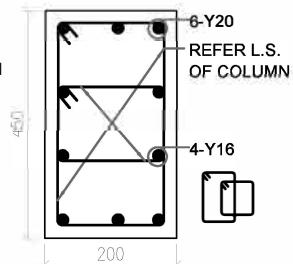
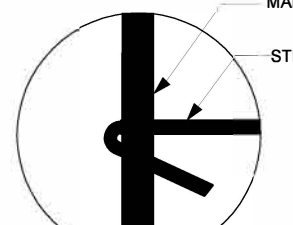
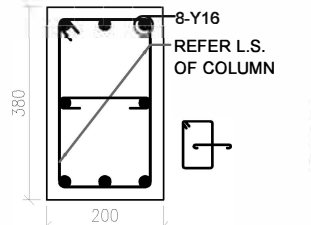


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LAYOUT OF COLUMN

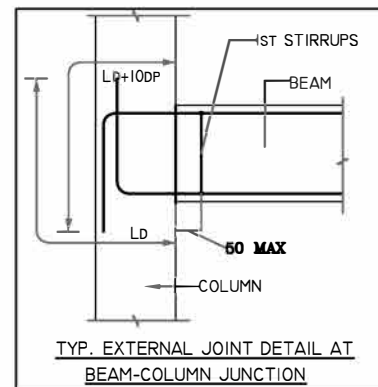
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C.S. OF COLUMN "C1"
(300 x 450)
UP TO SFRC.S. OF COLUMN "C1"
(200 x 450)
SFR TO TOPC.S. OF COLUMN "C2"
(300 x 450)
UP TO SFRC.S. OF COLUMN "C2"
(200 x 450)
SFR TO TOPC.S. OF COLUMN "C3"
(200 x 380)
UP TO TOP

HOOK DETAIL

COLUMN SCHEDULE

S.NO.	NAME	SIZE	
		UPTO STILT ROOF	STILT ROOF TO TOP
1.	C1	300 X 450	200 X 450
2.	C2	300 X 450	200 X 450
3.	C3	200 X 380	200 X 380

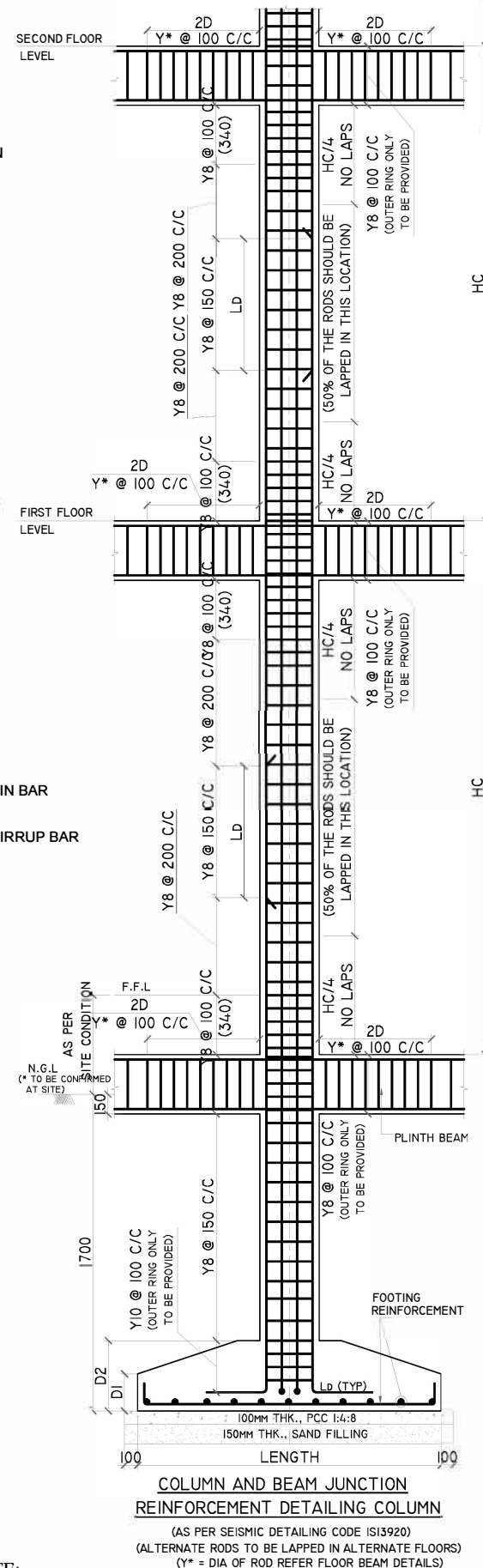
TYP. EXTERNAL JOINT DETAIL AT
BEAM-COLUMN JUNCTION

NOTE:

N.G.L. - NATURAL GROUND LEVEL.

ALL HOOKS SHOULD BE BENT TO AN
ANGLE OF 135° WITH A LENGTH NOT
LESS THAN 75 MM

FOR APPROVAL ONLY

COLUMN AND BEAM JUNCTION
REINFORCEMENT DETAILING COLUMN(AS PER SEISMIC DETAILING CODE IS13920)
(ALTERNATE RODS TO BE LAPPED IN ALTERNATE FLOORS)
(Y* = DIA OF ROD REFER FLOOR BEAM DETAILS)

GENERAL NOTES:

REMOVAL OF FORMWORK(SHUTTERING) :

SHUTTERING OF ANY PART OF THE STRUCTURE SHALL NOT BE REMOVED UNTIL THE CONCRETE ATTAINS 70% THE SPECIFIED STRENGTH OF CONCRETE. HOWEVER THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR) SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER CLAUSE II.3.1, IS 456:2000

A) VERTICAL SIDE OF SHUTTERING OF COLUMNS/WALLS

LAP JOINTS FOR REINFORCEMENT BARS :

i) AT ANY CROSS SECTION OF THE MEMBER, NOT MORE THAN 50% THE BARS SHALL BE LAPPED.

ii) LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF 1.3 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.

iii) DEVELOPMENT LENGTH (LD) SHALL BE AS PER (SP:34-1999) TABLE BELOW:

a) DEVELOPMENT LENGTH FOR COLUMN BARS -40D

b) DEVELOPMENT LENGTH FOR BEAM BARS -50D

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v) DETAILING OF REBARS SHALL CONFIRM TO IRC

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GENERAL NOTES:

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- GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE Fe 500 CONFIRMING TO IS 1786-2008
- CLEAR COVER FOR REINFORCEMENT
a) COLUMN = 40MM
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- COLUMNS AND FOOTINGS ARE DESIGNED FOR S+4 FLOOR LOADS AND SBC OF THE SOIL IS 150KN/ SQM. @ 1800 BELOW N.G.L.
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REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL	S.K	R.M	18.02.26

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT - 16.00M) RESIDENTIAL BUILDING WITH 12 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO.31 IN VANCHINATHAN STREET, MADIPAKKAM, CHENNAI 600091, COMPRISED IN OLD S.NO.220/1 AND 220/28 AS PER PATTAN S.NO. 220/139 OF MADIPAKKAM-1 VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

DRAWING TITLE :-

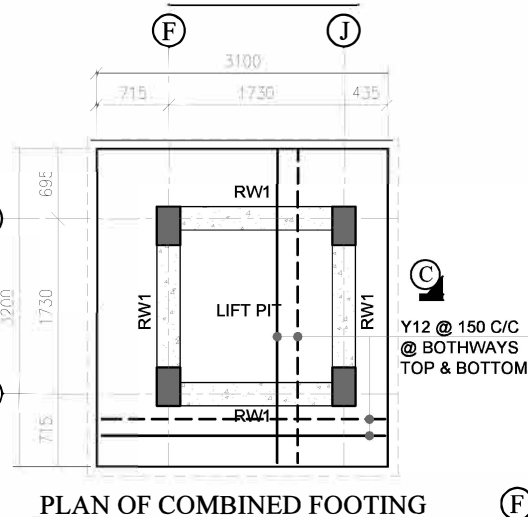
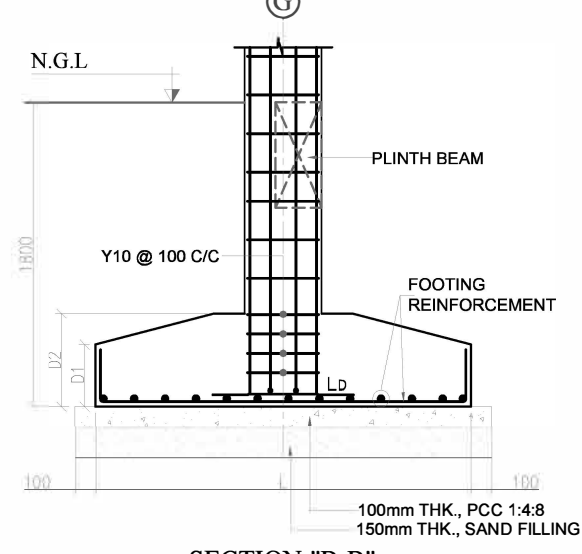
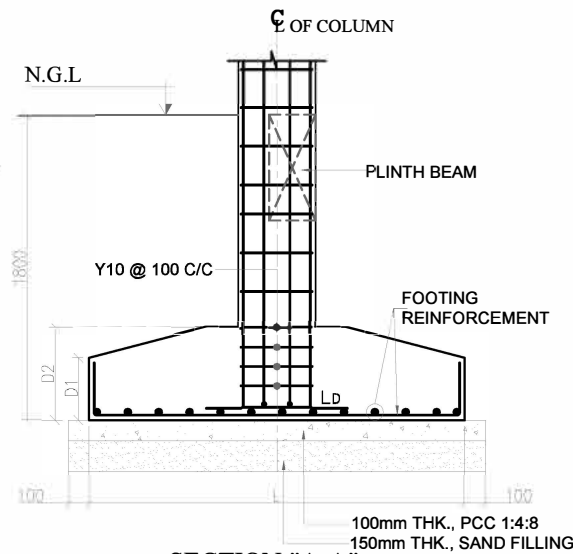
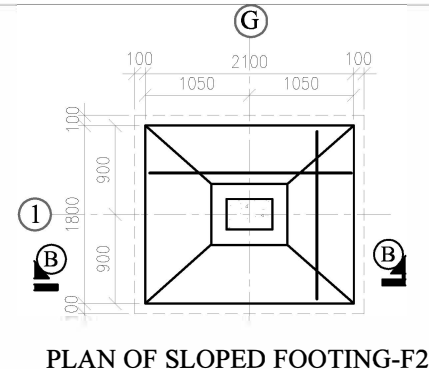
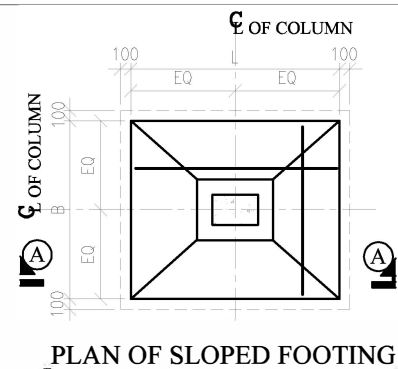
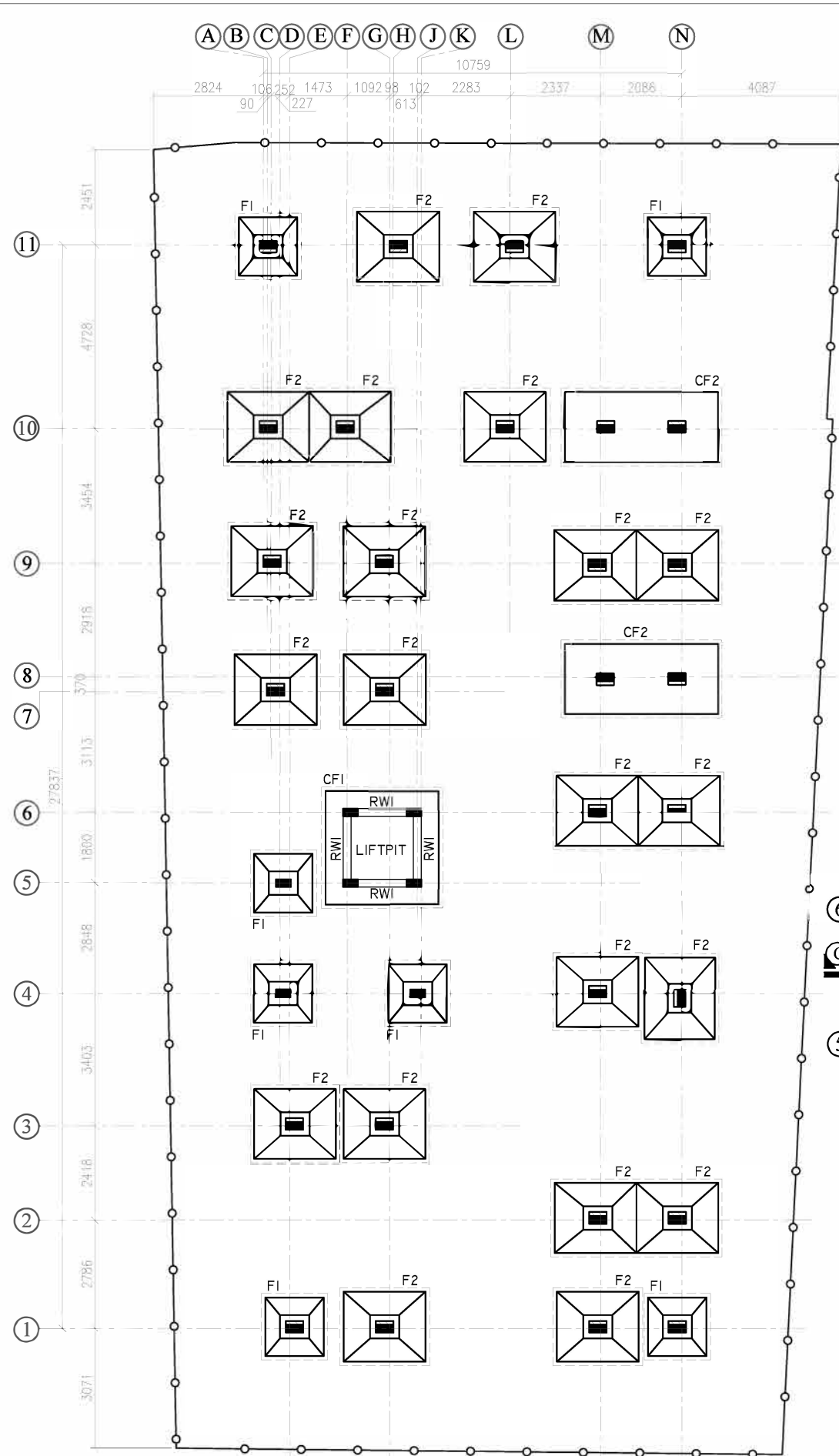
LAYOUT & R.C DETAILS OF COLUMN

DATE	SCALE	JOB.NO	DRG.NO
18.02.26	1 : 120	*****	001

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

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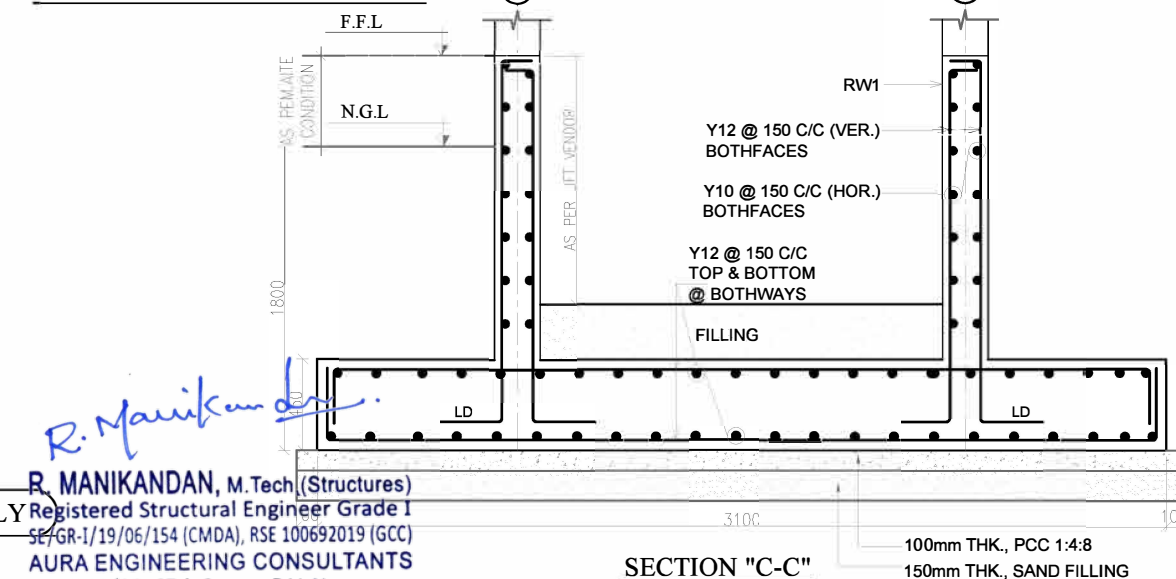


FOOTINGS SCHEDULE:-

SI.	FOOTING NAME	FOOTING SIZE	FOOTING REINFORCEMENT
01	F1	1500 X 1500 SLOPED FOOTING D1=250, D2=450	Y10 @ 150 C/C BOTHWAYS @ BOTTOM
02	F2	1800 X 2100 SLOPED FOOTING D1=300, D2=550	Y12 @ 150 C/C BOTHWAYS @ BOTTOM

COMBINED FOOTINGS SCHEDULE:-

SI.	FOOTING NAME	FOOTING SIZE	FOOTING REINFORCEMENT
01	CF1	2600 X 1500 D=380	Y12 @ 150 C/C @ BOTHWAYS TOP & BOTTOM



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A) FOOTING = 50MM B) R.C WALL = 25MM
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DRAWING TITLE :-

LAYOUT & R.C DETAILS OF FOOTING

DATE	SCALE	JOB.NO	DRG.NO
18.02.26	1 : 120	*****	002

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

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NOTE:

N.G.L. - NATURAL GROUND LEVEL.

FOR APPROVAL ONLY

R. MANIKANDAN, M.Tech (Structures)

Registered Structural Engineer Grade I

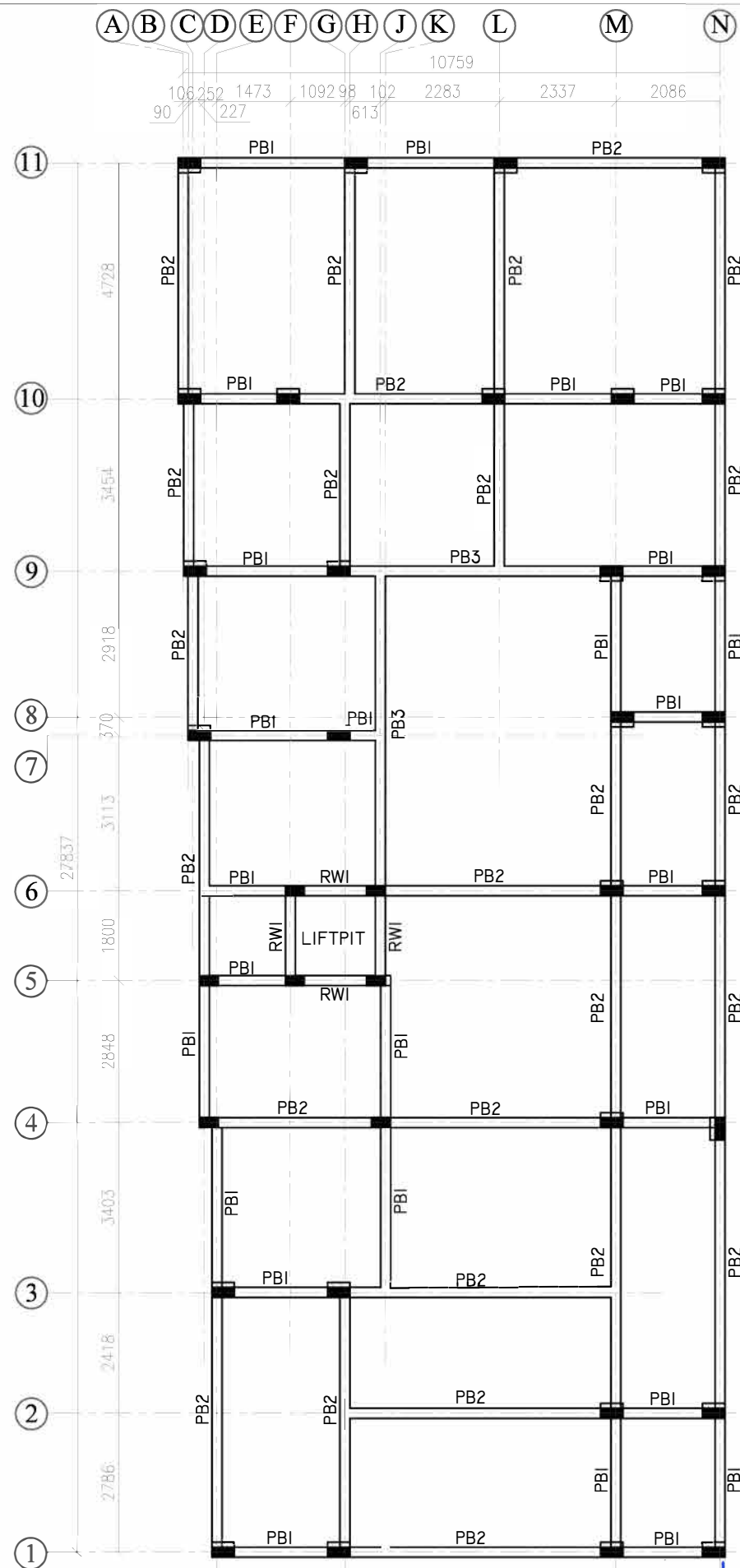
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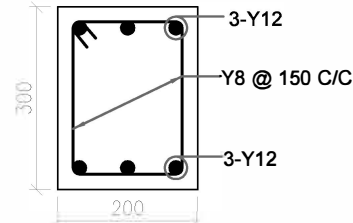
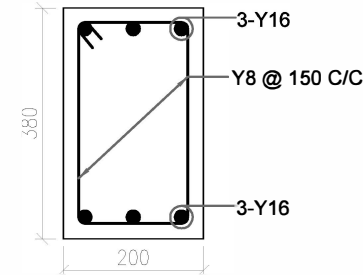
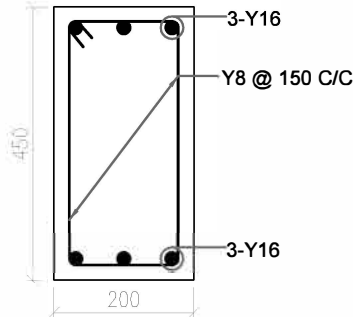
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LAYOUT OF PLINTH BEAM

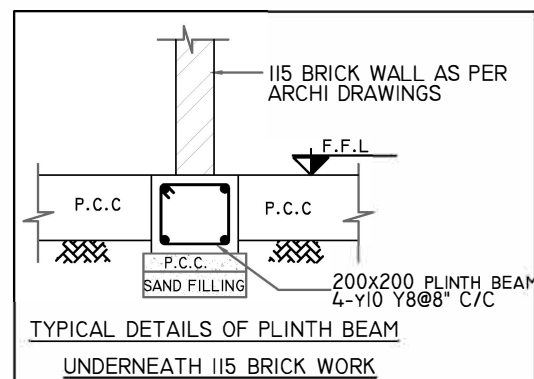
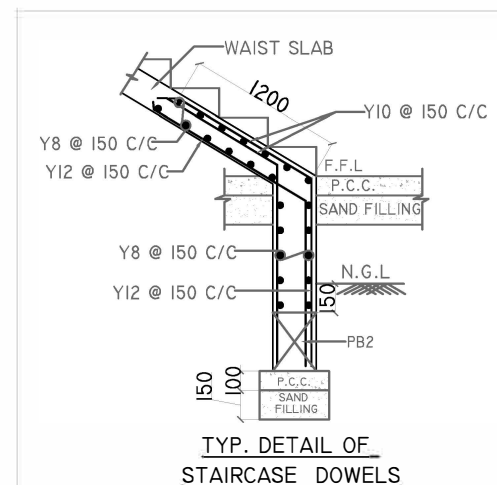
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C.S. OF BEAM "PB1"
(200 x 300)C.S. OF BEAM "PB2"
(200 x 380)C.S. OF BEAM "PB3"
(200 x 450)

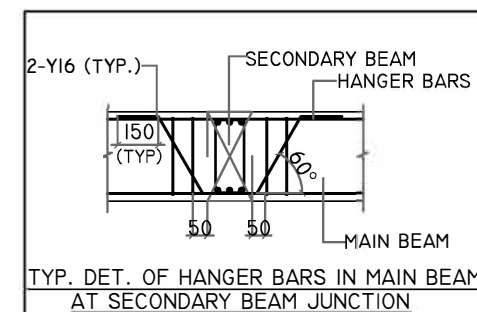
NOTE:

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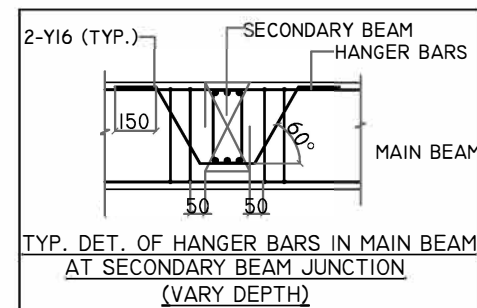
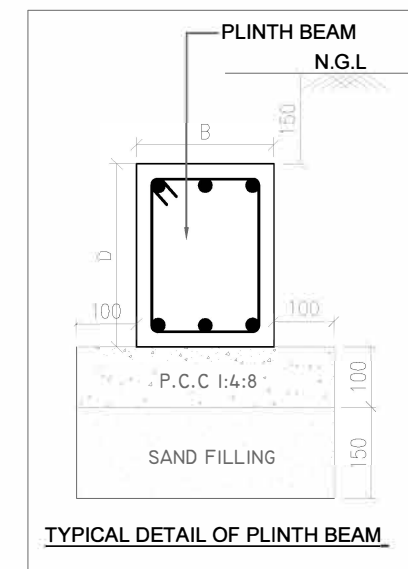
F.F.L - FLOOR FINISH LEVEL

TYPICAL DETAILS OF PLINTH BEAM
UNDERNEATH 115 BRICK WORKTYP. DETAIL OF
STAIRCASE DOWELS

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	PB1	200 x 300
02	PB2	200 x 380
03	PB3	200 x 450

TYP. DET. OF HANGER BARS IN MAIN BEAM
AT SECONDARY BEAM JUNCTION

FOR APPROVAL ONLY

TYP. DET. OF HANGER BARS IN MAIN BEAM
AT SECONDARY BEAM JUNCTION
(VARY DEPTH)

TYPICAL DETAIL OF PLINTH BEAM

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4. CLEAR COVER FOR REINFORCEMENT
 A) BEAM = 30MM B) R.C WALL = 25MM

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DRAWING TITLE :-

LAYOUT & R.C DETAILS OF PLINTH BEAM

DATE	SCALE	JOB.NO	DRG.NO
18.02.26	1 : 100	*****	003

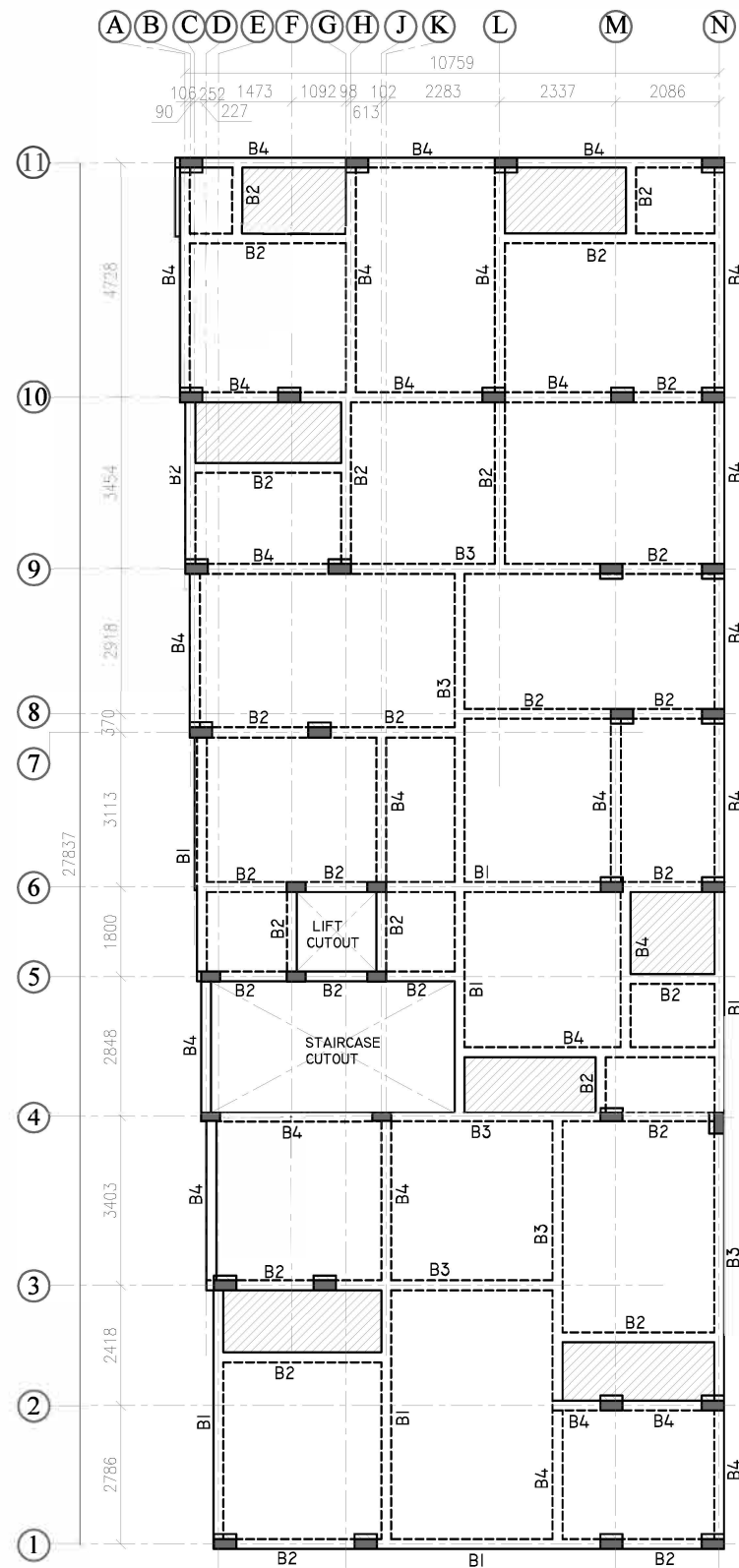
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

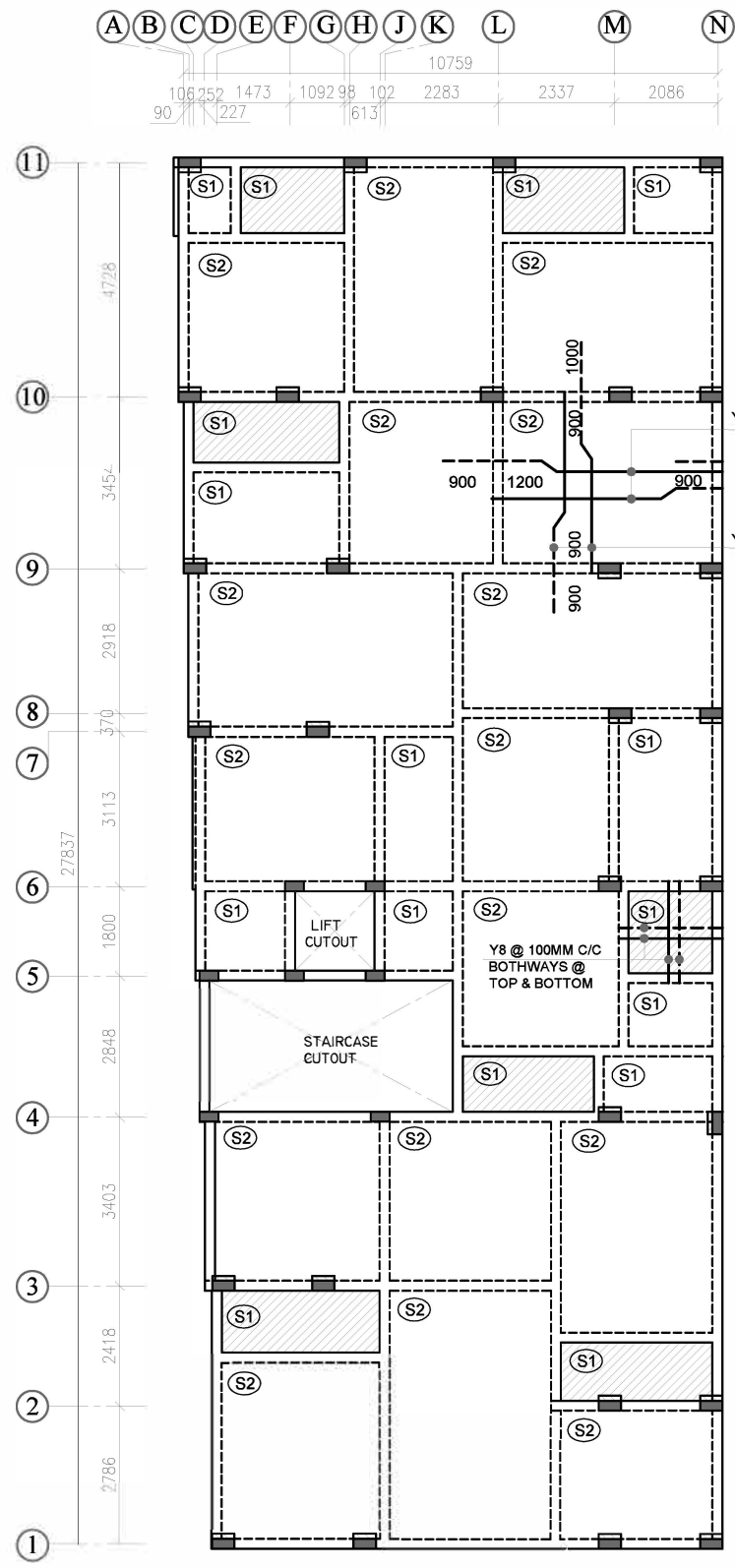
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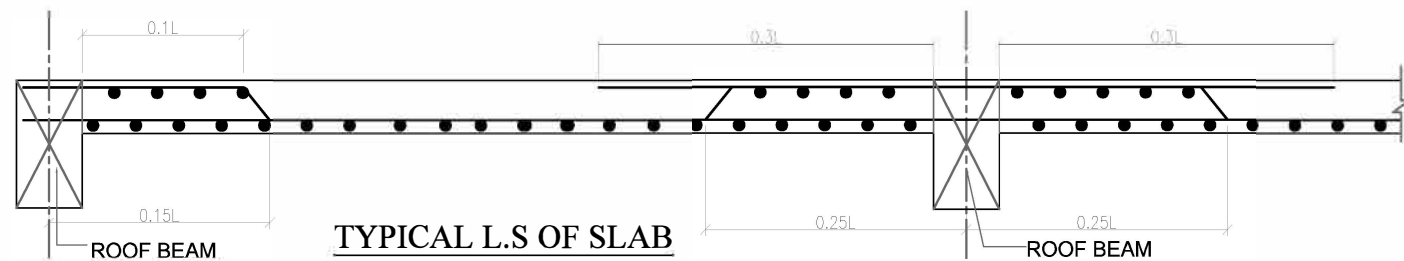
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NUMERATION LAYOUT OF STILT FLOOR
ROOF SLAB & BEAM



R.C LAYOUT OF STILT FLOOR
ROOF SLAB & BEAM



TYPICAL L.S OF SLAB

NOTE:

SLAB SUNK BY 0'-10"

PROVIDE Y8 @ 8" C/C AS DISTRIBUTORS
WHERE EVER REQUIRED

FOR BEAM REINFORCEMENT
DETAILS REFER DWG.NO : 007

COLUMN CURTAILED TO BE BEND IN TO
TOP OF THE SLAB

SLAB SCHEDULE

SL.NO	NAME	THICK
01	S1	150 THK.
02	S2	150 THK.

BEAM SCHEDULE

SL.NO	NAME	SIZE
01	B1	200 x 450
02	B2	200 x 450
03	B3	200 x 530
04	B4	200 x 450

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GENERAL NOTES:

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- DETAILING OF REBARS SHALL CONFIRM TO IBC

EXCAVATION AND BACKFILL

- BACKFILL FOR FOUNDATIONS AND PITS SHALL BE PLACED EVENLY LAYERS OF 300 MM THICKNESS AND SHALL BE WELL COMPACTED. THE FILL SHALL CONTAIN NO STONES WITH A DIAMETER GREATER THAN 100 MM. THE DEGREE OF COMPACTION OF BACKFILL SHALL BE 95% OF THE MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT OBTAINED BY THE MODIFIED PROCTOR COMPACTION TEST.
- UNSUITABLE MATERIALS LIKE ROCKS/ EXISTING FOOTINGS ARE DETECTED BELOW FOUNDATION LEVEL IN AREAS OF CUT SHALL BE EXCAVATED TO FIRM GROUND. THE RESULTANT EXCAVATION SHALL BE FILLED TO THE REQUIRED LEVELS WITH MASS CONCRETE GRADE M10. ALSO WHEREVER EXCAVATION OCCURS BELOW THE FOUNDATION LEVEL STATED ON THE DESIGN DRAWING THE RESULTING VOID SHALL BE BACK FILLED WITH MASS CONCRETE GRADE-10.
- BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED 0M.40FT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 10
- A LAYER OF BLINDING CONCRETE 100 MM THICK SHALL BE PLACED UNDER ALL FOUNDATIONS. BLINDING CONCRETE SHALL HAVE A CHARACTERISTIC STRENGTH OF 10 N/MM² AT 28 DAYS.
- EXCAVATED FINE-GRAINED SOIL ENCOUNTERED AT SHALLOW DEPTHS SHALL BE IN NO CASE USED FOR BACK FILLING PURPOSES.

GENERAL NOTES:

- ALL DIMENSIONS ARE IN MM.
- CONCRETE GRADE SHALL BE M25 (1:1.5:3) CONFIRMING TO IS 456:2000
- GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE Fe 500 CONFIRMING TO IS 1786-2008
- CLEAR COVER FOR REINFORCEMENT
A) BEAM = 30MM B) SLAB = 20MM
- THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
- STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
- ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

00	ISSUE FOR APPROVAL	S.K	R.M	18.02.26
REV.	DESCRIPTIONS	DRN	CHK	DATE

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT - 16.00M) RESIDENTIAL BUILDING WITH 12 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO.31 IN VANCHINATHAN STREET,MADIPAKKAM, CHENNAI 600091, COMPRISED IN OLD S.NO.220/1 AND 220/28 AS PER PATTAN NEW S.NO. 220/139 OF MADIPAKKAM-1 VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

DRAWING TITLE :-

NUMERATION LAYOUT & R.C LAYOUT OF
STILT FLOOR ROOF SLAB & BEAMS

DATE	SCALE	JOB.NO	DRG.NO
18.02.26	1 : 100	-----	004

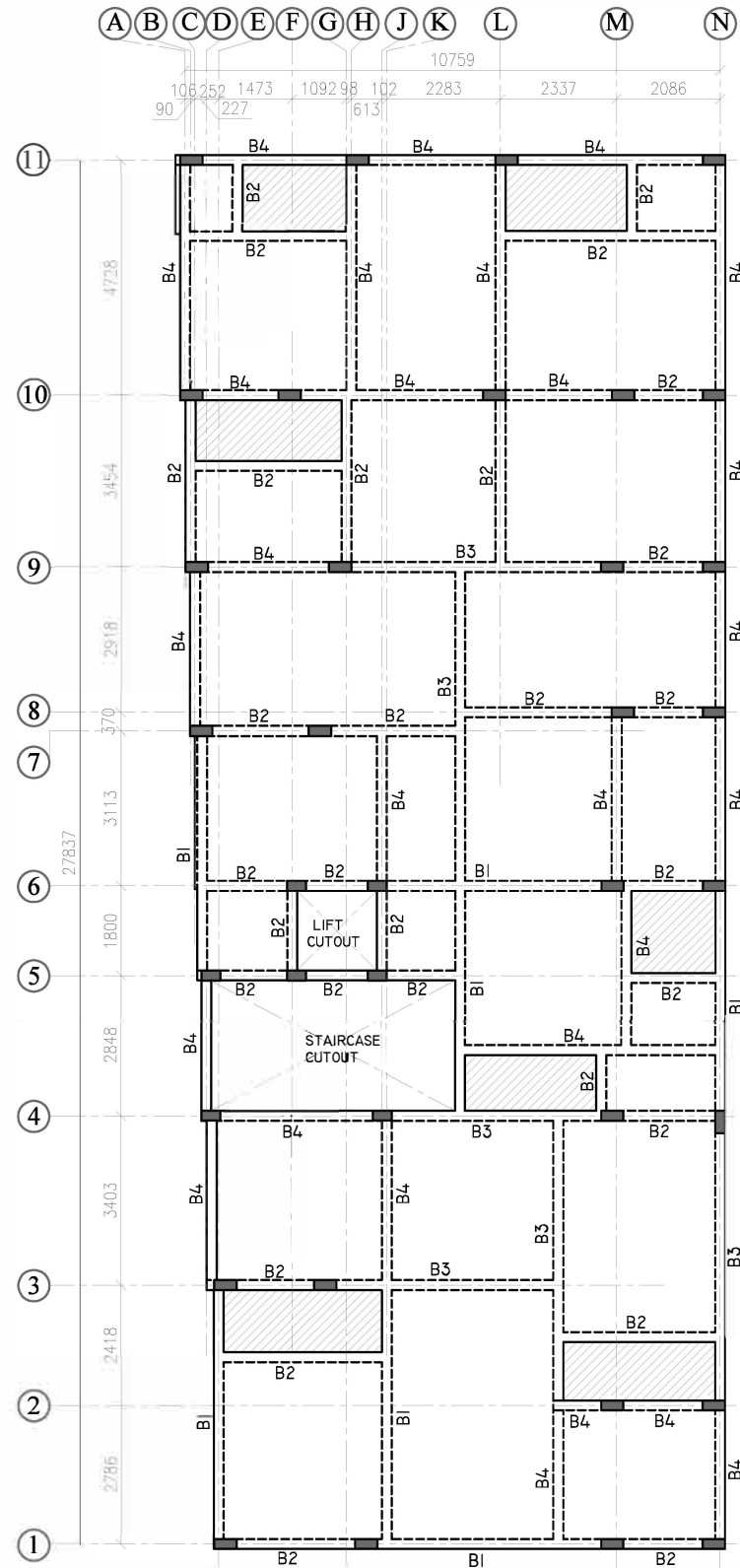
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

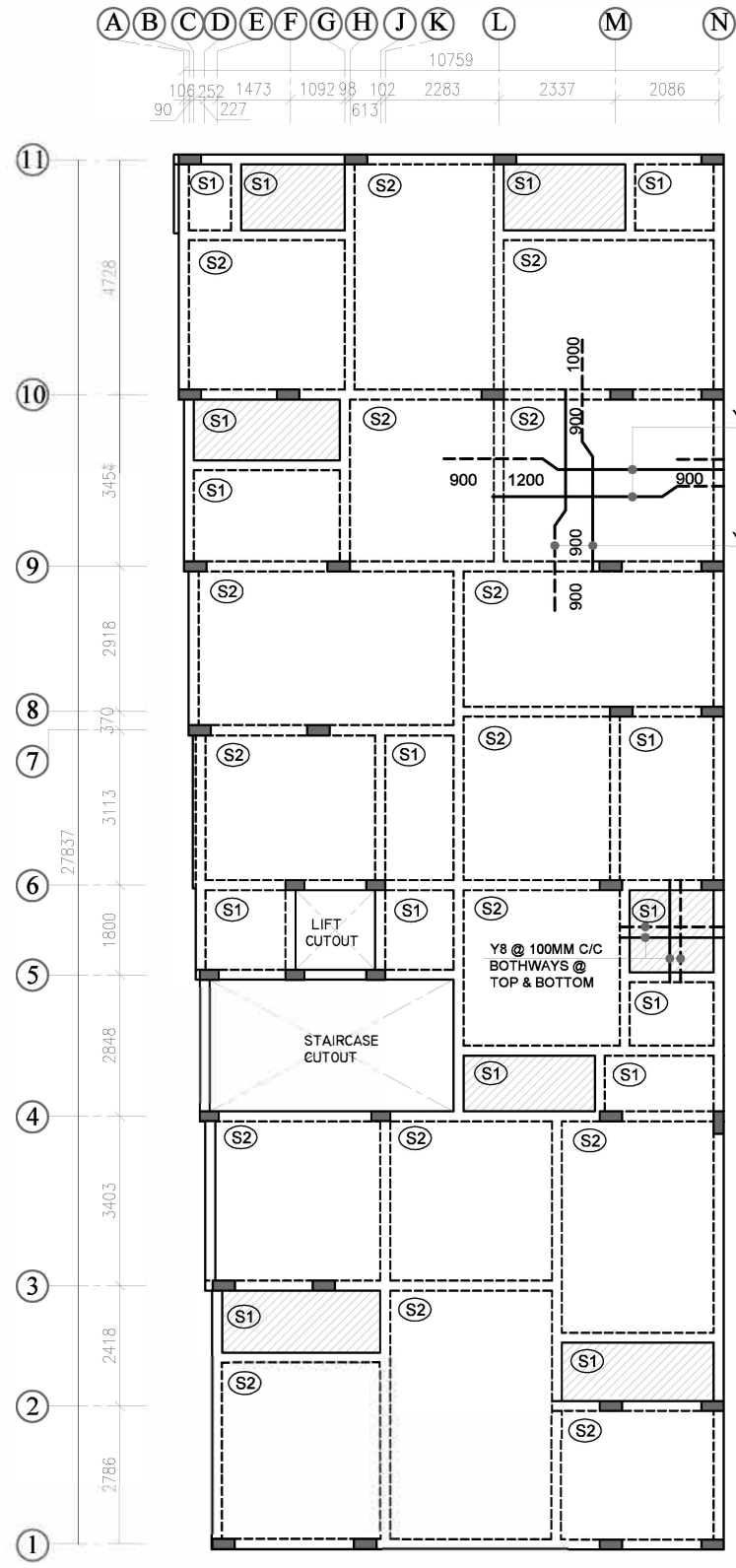
AURA ENGINEERING CONSULTANTS
#8, 50th St, Sarvamangala Colony, 7th Avenue,
ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line :- 044 4859 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/



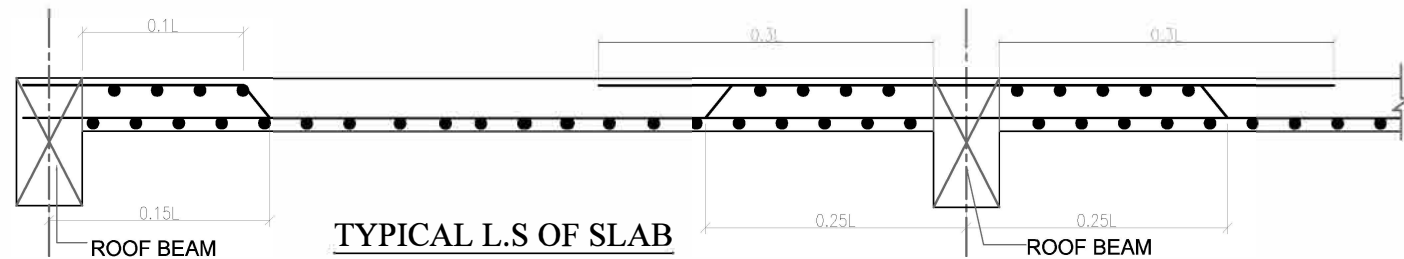
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NUMERATION LAYOUT OF TYPICAL FLOOR
ROOF SLAB & BEAM



R.C LAYOUT OF TYPICAL FLOOR
ROOF SLAB & BEAM



NOTE:

SLAB SUNK BY 0'-10"

PROVIDE Y8 @ 8" C/C AS DISTRIBUTORS
WHERE EVER REQUIRED

FOR BEAM REINFORCEMENT
DETAILS REFER DWG.NO : 007

SLAB SCHEDULE

SL.NO	NAME	THICK
01	S1	150 THK.
02	S2	150 THK.

BEAM SCHEDULE

SL.NO	NAME	SIZE
01	B1	200 x 450
02	B2	200 x 450
03	B3	200 x 530
04	B4	200 x 450

FOR APPROVAL ONLY

GENERAL NOTES:

REMOVAL OF FORMWORK(SHUTTERING) :

SHUTTERING OF ANY PART OF THE STRUCTURE SHALL NOT BE REMOVED UNTIL THE CONCRETE ATTAINS 70% THE SPECIFIED STRENGTH OF CONCRETE. HOWEVER THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR) SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER CLAUSE II.3.1, IS 456:2000
A) VERTICAL SIDE OF SHUTTERING OF COLUMNS,WALLS

LAP JOINTS FOR REINFORCEMENT BARS :

- AT ANY CROSS SECTION OF THE MEMBER,NOT MORE THAN 50% THE BARS SHALL BE LAPPED.
- LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF 1.3 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.
- DEVELOPMENT LENGTH (Ld) SHALL BE AS PER (SP:34-1999) TABLE BELOW:
A) DEVELOPMENT LENGTH FOR COLUMN BARS -40D
B) DEVELOPMENT LENGTH FOR BEAM BARS -50D
- LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL .
- DETAILING OF REBARS SHALL CONFIRM TO IBC

EXCAVATION AND BACKFILL

- BACKFILL FOR FOUNDATIONS AND PITS SHALL BE PLACED EVENLY LAYERS OF 300 MM THICKNESS AND SHALL BE WELL COMPACTED. THE FILL SHALL CONTAIN NO STONES WITH A DIAMETER GREATER THAN 100 MM. THE DEGREE OF COMPACTION OF BACKFILL SHALL BE 95% OF THE MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT OBTAINED BY THE MODIFIED PROCTOR COMPACTION TEST.
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A) BEAM = 30MM B) SLAB = 20MM
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DRAWING TITLE :-

NUMERATION LAYOUT & R.C LAYOUT OF
TYPICAL FLOOR ROOF SLAB & BEAMS

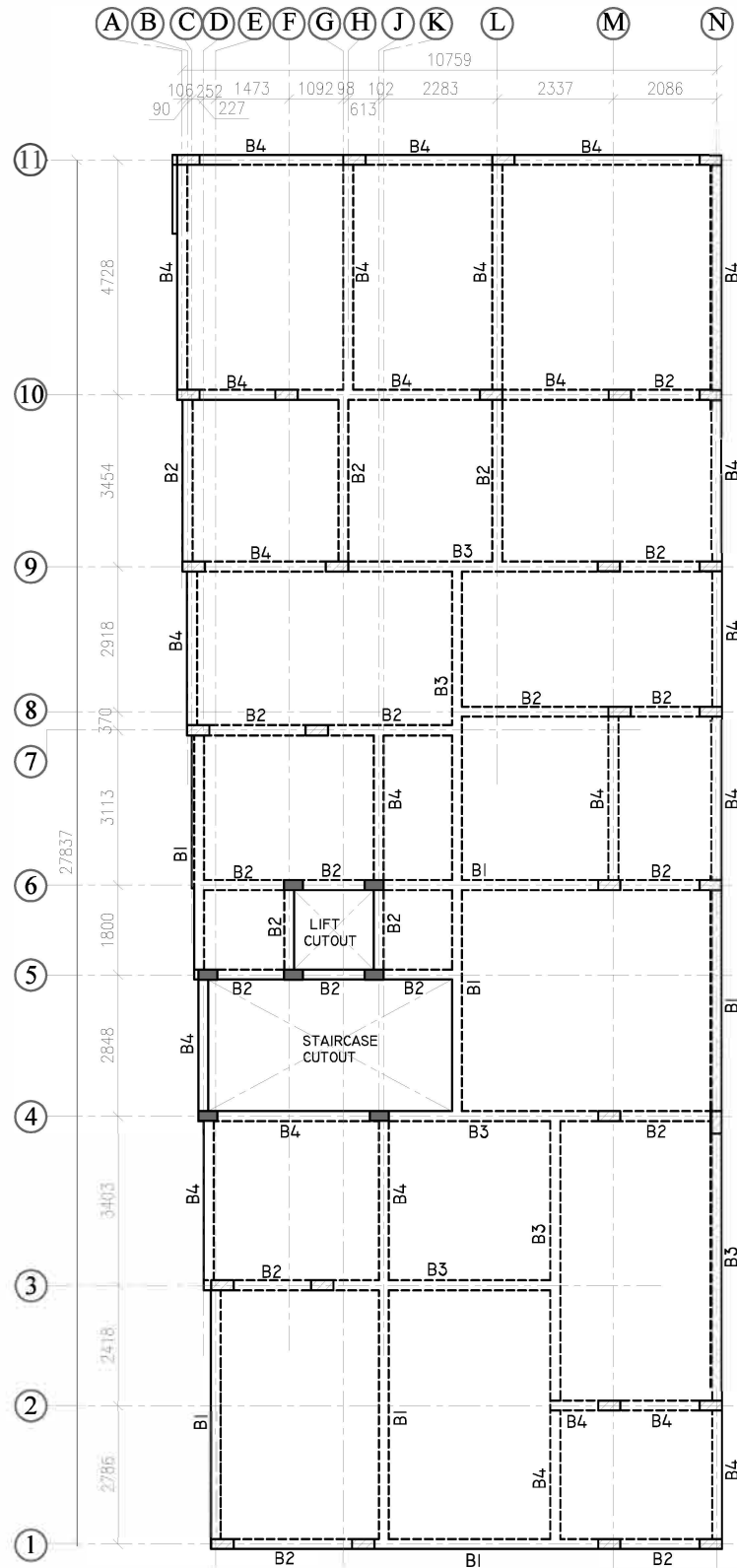
DATE	SCALE	JOB.NO	DRG.NO
18.02.26	1 : 100	-----	005

ARCHITECT / CONSULTANTS :-

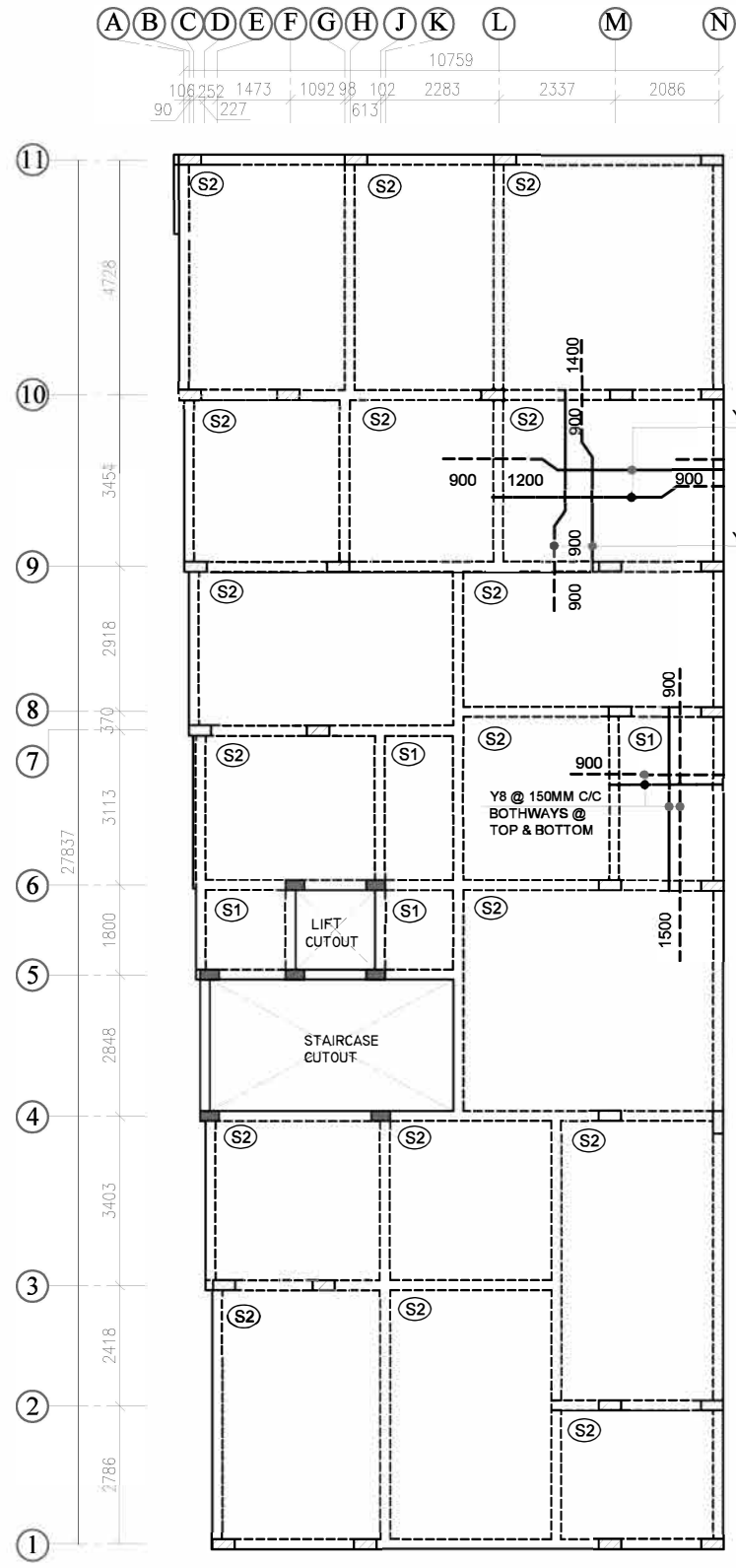
STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS
#8, 50th St, Sarvamangala Colony, 7th Avenue,
ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line :- 044 4859 7100
projects.auraengg@gmail.com
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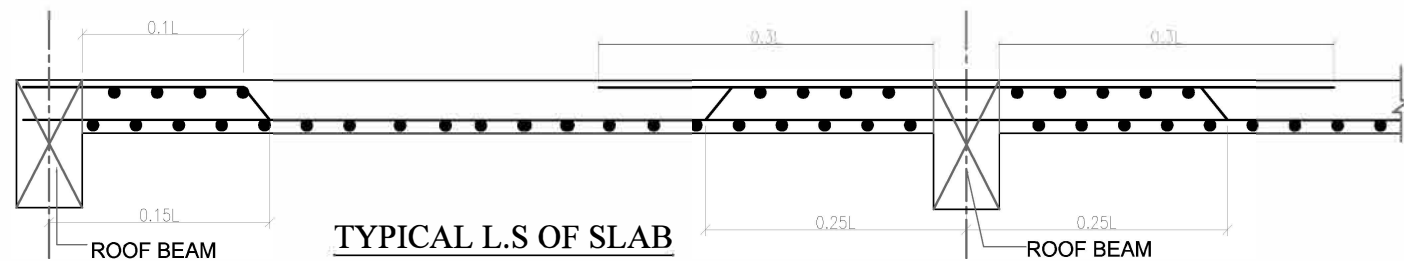
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NUMERATION LAYOUT OF TERRACE
FLOOR SLAB & BEAM



R.C LAYOUT OF TERRACE
FLOOR SLAB & BEAM



TYPICAL L.S OF SLAB

NOTE:

PROVIDE Y8 @ 8" C/C AS DISTRIBUTORS
WHERE EVER REQUIRED

FOR BEAM REINFORCEMENT
DETAILS REFER DWG.NO : 007

COLUMN CURTAILED TO BE BEND IN TO
TOP OF THE SLAB

SLAB SCHEDULE

SL.NO	NAME	THICK
01	S1	150 THK.
02	S2	150 THK.

BEAM SCHEDULE

SL.NO	NAME	SIZE
01	B1	200 x 450
02	B2	200 x 450
03	B3	200 x 530
04	B4	200 x 450

FOR APPROVAL ONLY

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DRAWING TITLE :-

NUMERATION LAYOUT & R.C LAYOUT OF
TERRACE FLOOR SLAB & BEAMS

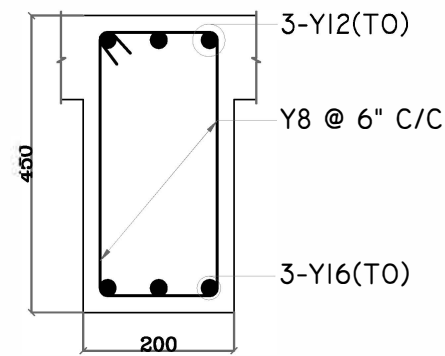
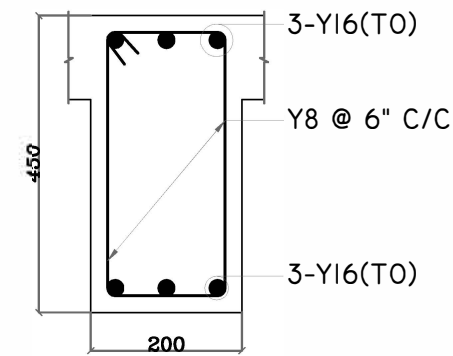
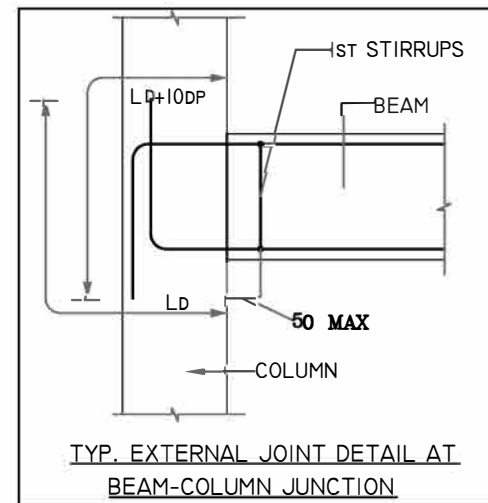
DATE	SCALE	JOB.NO	DRG.NO
18.02.26	1 : 100	-----	006

ARCHITECT / CONSULTANTS :-

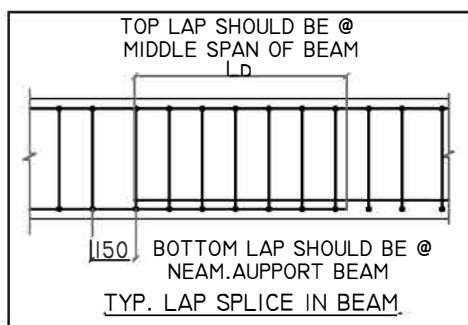
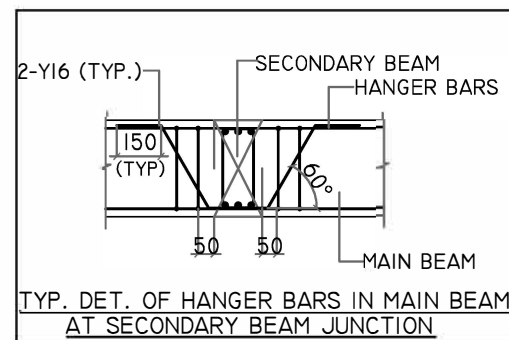
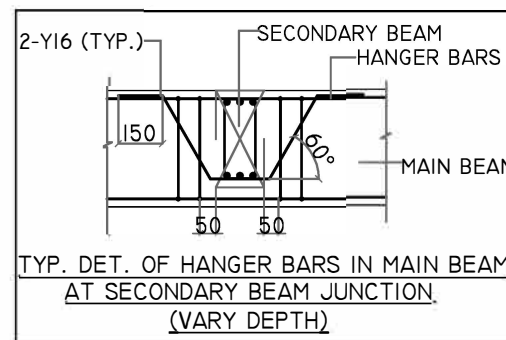
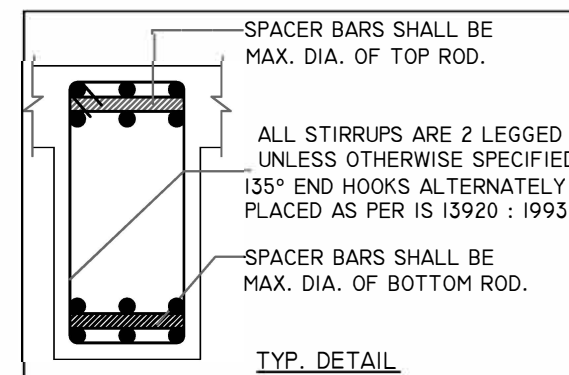
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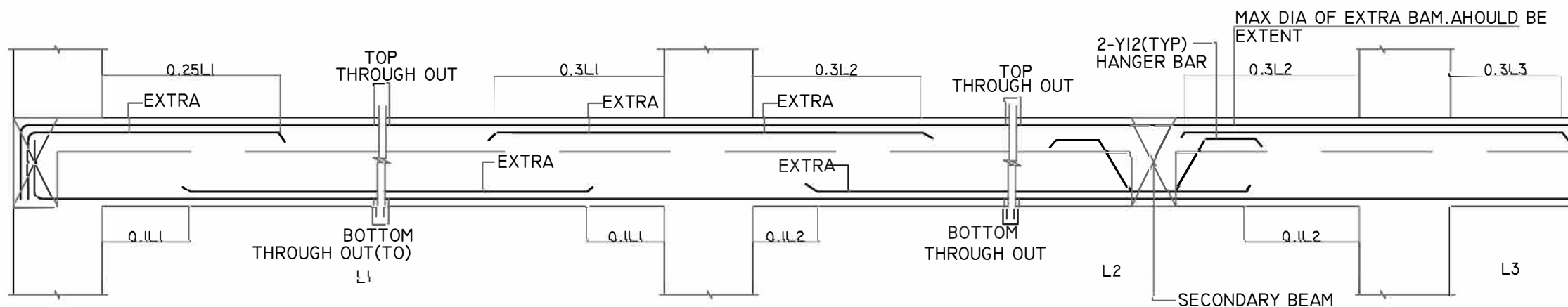
NAME	MID SPAN	END SUPPORT
B1 (200 X 450)		
B3 (200 X 530)		

C.S. OF BEAM "B2"
(200 X 450)C.S. OF BEAM "B4"
(200 X 450)TYP. EXTERNAL JOINT DETAIL AT
BEAM-COLUMN JUNCTION

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	200 x 450
02	B2	200 x 450
03	B3	200 x 530
04	B4	200 x 450

TOP LAP SHOULD BE @
MIDDLE SPAN OF BEAMBOTTOM LAP SHOULD BE @
NEAR SUPPORT BEAM
TYP. LAP SPLICE IN BEAMTYP. DET. OF HANGER BARS IN MAIN BEAM
AT SECONDARY BEAM JUNCTIONTYP. DET. OF HANGER BARS IN MAIN BEAM
AT SECONDARY BEAM JUNCTION
(VARY DEPTH)

TYP. DETAIL



TYPICAL L.S OF ROOF BEAM

GENERAL NOTES:

- ALL DIMENSIONS ARE IN FOOT UNITS.
- CONCRETE GRADE SHALL BE M25 CONFIRMING TO IS 456:2000
- GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE Fe 500 CONFIRMING TO IS 1786-2008
- CLEAR COVER FOR REINFORCEMENT
A) COLUMN = 1½" B) BEAM = 1"
C) SLAB = ¾"
- THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
- STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
- DEVELOPMENT LENGTH (LD) SHALL BE AS PER (SP:34-1999) TABLE BELOW:

DEVELOPMENT LENGTH FOR COLUMNS	= 40d
DEVELOPMENT LENGTH FOR BEAMS	= 50d

- DETAILING OF REBARS SHALL CONFIRM TO SP-34 & IS 13920.

R. Manikandan

R. MANIKANDAN, M.Tech.(Structures)
Registered Structural Engineer Grade I
SE/GR-1/19/06/154 (CMDA), RSE 100692019 (GCC)
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Ashok Nagar, Chennai-600 083.
Ph: 044-48597100 Cell: 9790751378

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DRAWING TITLE :-

R.C. DETAILS FOR ALL
FLOOR BEAMS

DATE	SCALE	JOB.NO	DRG.NO
18.02.26	1 : 130	-----	007

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

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